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**AERONAUTICS**

Includes aeronautics (general); aerodynamics; air transportation and safety; aircraft communications and navigation; aircraft design, testing and performance; aircraft instrumentation; aircraft propulsion and power; aircraft stability and control; and research and support facilities (air).

For related information see also *Astronautics*.

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Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

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Includes quantum mechanics; and Bose and Fermi statistics.
For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

## SOCIAL SCIENCES

Includes social sciences (general); administration and management; documentation and information science; economics and cost analysis; law and political science; and urban technology and transportation.

**80 SOCIAL SCIENCES (GENERAL)** **N.A.**
Includes educational matters.

**81 ADMINISTRATION AND MANAGEMENT** **2150**
Includes management planning and research.

**82 DOCUMENTATION AND INFORMATION SCIENCE** 2151
Includes information storage and retrieval technology; micrography; and library science.
For computer documentation see *61 Computer Programming and Software.*

**83 ECONOMICS AND COST ANALYSIS** N.A.
Includes cost effectiveness studies.

**84 LAW AND POLITICAL SCIENCE** 2154
Includes space law; international law; international cooperation; and patent policy.

**85 URBAN TECHNOLOGY AND TRANSPORTATION** 2154
Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.
For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

## SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences.*

**88 SPACE SCIENCES (GENERAL)** N.A.

**89 ASTRONOMY** 2154
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

**90 ASTROPHYSICS** 2156
Includes cosmology; and interstellar and interplanetary gases and dust.

**91 LUNAR AND PLANETARY EXPLORATION** 2157
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

**92 SOLAR PHYSICS** 2157
Includes solar activity, solar flares, solar radiation and sunspots.

**93 SPACE RADIATION** 2159
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

## GENERAL

**99 GENERAL** 2159

**Note: N.A. means that no abstracts were assigned to this category for this issue.**

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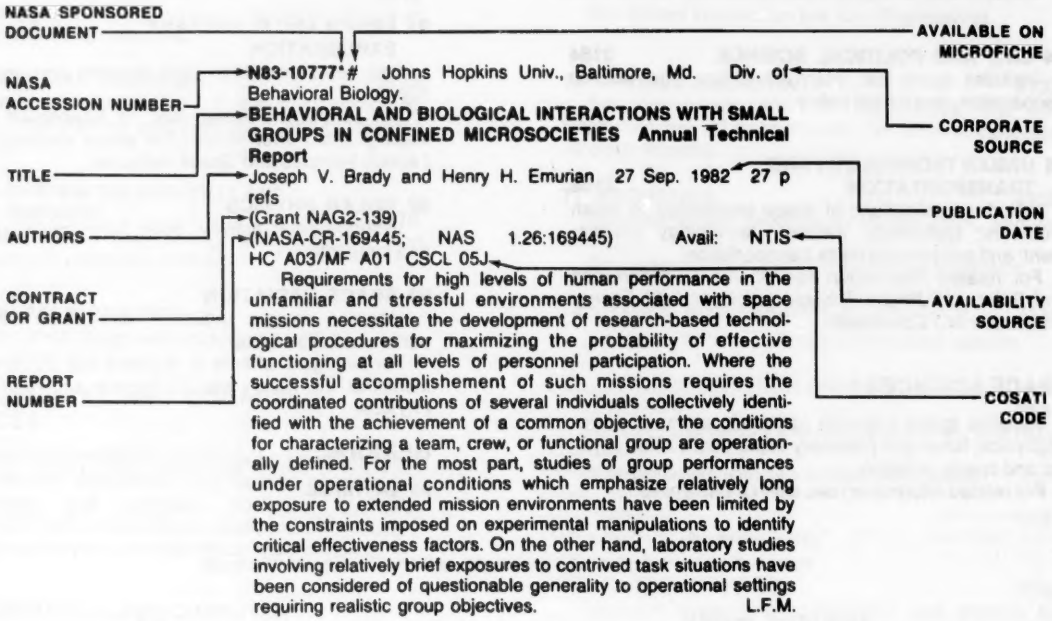
# TYPICAL CITATION AND ABSTRACT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BEHAVIORAL AND BIOLOGICAL INTERACTIONS WITH SMALL GROUPS IN CONFINED MICROSOCIETIES Annual Technical Report
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Joseph V. Brady and Henry H. Emurian 27 Sep. 1982 27 p refs
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Requirements for high levels of human performance in the unfamiliar and stressful environments associated with space missions necessitate the development of research-based technological procedures for maximizing the probability of effective functioning at all levels of personnel participation. Where the successful accomplishement of such missions requires the coordinated contributions of several individuals collectively identified with the achievement of a common objective, the conditions for characterizing a team, crew, or functional group are operationally defined. For the most part, studies of group performances under operational conditions which emphasize relatively long exposure to extended mission environments have been limited by the constraints imposed on experimental manipulations to identify critical effectiveness factors. On the other hand, laboratory studies involving relatively brief exposures to contrived task situations have been considered of questionable generality to operational settings requiring realistic group objectives. L.F.M.

VOLUME 21 NUMBER 13/JULY 8, 1983

# Scientific and Technical Aerospace Reports

*A Semimonthly Publication of the National Aeronautics and Space Administration*

## 01 AERONAUTICS (GENERAL)

**N83-23267*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
**INFLUENCE OF SAMPLING RATE ON THE CALCULATED FIDELITY OF AN AIRCRAFT SIMULATION**
James C. Howard Apr. 1983 12 p refs Presented at the ISA 14th Ann. Modeling and Simulation Conf., Pittsburg, Mass., 21-22 Apr. 1983
(NASA-TM-84354; A-9293; NAS 1.15:84354) Avail: NTIS HC A02/MF A01 CSCL 01B

One of the factors that influences the fidelity of an aircraft digital simulation is the sampling rate. As the sampling rate is increased, the calculated response of the discrete representation tends to coincide with the response of the corresponding continuous system. Because of computer limitations, however, the sampling rate cannot be increased indefinitely. Moreover, real-time simulation requirements demand that a finite sampling rate be adopted. In view of these restrictions, a study was undertaken to determine the influence of sampling rate on the response characteristics of a simulated aircraft describing short-period oscillations. Changes in the calculated response characteristics of the simulated aircraft degrade the fidelity of the simulation. In the present context, fidelity degradation is defined as the percentage change in those characteristics that have the greatest influence on pilot opinion: short period frequency omega, short period damping ratio zeta, and the product omega zeta. To determine the influence of the sampling period on these characteristics, the equations describing the response of a DC-8 aircraft to elevator control inputs were used. The results indicate that if the sampling period is too large, the fidelity of the simulation can be degraded. Author

**N83-23268#** Office of Science and Technology, Washington, D.C.
**AERONAUTICAL RESEARCH AND TECHNOLOGY POLICY, VOLUME 2 Final Report**
Nov. 1982 665 p refs For Volume 1 see N83-17452
Avail: NTIS HC A99/MF A01

Policy options on aeronautical research and technology (R&T) are reviewed including current and future needs, capabilities, and incentives in both government and private industry. The evolution of the U.S. aeronautics industry and the efforts of the foreign aeronautics industries, militarily and in the civil marketplace, are examined along with long range U.S. military aeronautical needs, projections of the worldwide civil aviation market, and potential benefits resulting from continued military and civil aeronautical R&T. Within this framework, NASA's institutional role and current NASA/DOD programs and resources (facilities and manpower) are examined. National goals, government and agency roles, and policy alternatives for operation of aeronautical facilities and dissemination and control of research results are recommended and discussed. It is concluded that an advanced aeronautics capability is a unique and vital national and economic asset. Military excellence in aeronautics, the significance of aviation in the national transportation system, and the position of civil transport aircraft in international marketing efforts, coupled with the foreign efforts in aviation, warrant government support for aeronautical R&T. J.M.S.

**N83-23269#** Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
**DECISION SUPPORT SYSTEMS: AN APPROACH TO AIRCRAFT MAINTENANCE SCHEDULING IN THE STRATEGIC AIR COMMAND M.S. Thesis**
Stephen B. Hackett and Sam E. Pennartz Sep. 1982 132 p refs
(AD-A123039; AFIT-LSSR-42-82) Avail: NTIS HC A07/MF A01 CSCL 05/2

Maintaining increasingly complex Air Force weapon systems requires optimum use of all available resources. Timely and accurate resource coordination is vital to ensure continuous mission capability; any improvement in coordination can produce an increase in readiness. Essential to such resource coordination is the aircraft maintenance scheduling function at the unit level. It is hypothesized that the application of computer technology to the maintenance scheduling decision process could result in improved maintenance resource allocation. A promising tool for computer-aided scheduling exists; Decision Support Systems (DSS) are intended to combine the information storage and assimilation powers of the computer with the experienced judgement of the manager to produce more effective decisions. The first requirement of a DSS is to model the current decision process; this research effort has generated a maintenance scheduling model of a SAC wing-level organization. The architecture of the model is based on Integrated Computer-Aided Manufacturing (ICAM) technology, specifically incorporating the structure explained in the ICAM Definition (IDEFO) Function Modeling Manual. GRA

**N83-23270#** Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
**A SYSTEM DYNAMICS POLICY ANALYSIS MODEL OF THE AIR FORCE AIRCRAFT MODIFICATION SYSTEM M.S. Thesis**
Michael Y. Fong and Charles F. Hiser Sep. 1982 188 p refs
(AD-A122894; AFIT-LSSR-91-82) Avail: NTIS HC A09/MF A01 CSCL 05/1

The Air Force aircraft modification system has a complex and dynamic nature which continually challenges management's ability to develop effective policy to support decision-making. With the invaluable assistance of key managers within the modification process, a policy model of the process has been developed using the system dynamics concept. The formal and informal system structure and policies which currently exist for the aircraft modification process are addressed in the research. The purpose of the dynamic policy model is to provide a tool to assist Air Force strategic managers in understanding the complex nature of the system and to identify the most important areas that are sensitive to changes in either structure or policy. The model, thus, provides a device for policy development. Author (GRA)

**N83-23271#** Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
**AIRCRAFT AVAILABILITY: AN ACQUISITION DECISION STRATEGY M.S. Thesis**
LaRita M. Decker and Stephen J. Guilfoos Sep. 1982 104 p refs
(AD-A123060; AFIT-LSSR-14-82) Avail: NTIS HC A06/MF A01 CSCL 01/3

Technological complexity in today's USAF weapon systems coupled with the limiting maintenance factors of skilled manpower, ageing aircraft and overburdened logistics support systems have caused aircraft to spend more time in maintenance. By increasing aircraft availability, through decreased maintenance time, additional sorties can be generated, thereby effectively increasing the number of available aircraft. Based on A-10 aircraft data, this thesis determined the statistical significance of relating reduced maintenance time to increased availability. Three measures of availability were investigated: (1) number of sorties generated; (2) number of aircraft waiting to fly; and (3) calculated aircraft availability. Secondly, this thesis quantified the relationship between increased availability and equivalent additional aircraft and investigated the possible use of this relationship as an acquisition decision strategy. Author (GRA)

**N83-23272#** Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
**AN ANALYSIS OF THE F-16 AIRCRAFT REQUIREMENTS GENERATION PROCESS AND ITS ADVERSE IMPACT ON CONTRACTOR RATE CAPACITY M.S. Thesis**
Charles M. Reynolds, Jr. and Richard D. Schikora Sep. 1982 120 p refs
(AD-A123003; AFIT-LSSR-74-82) Avail: NTIS HC A06/MF A01 CSCL 01/3

The United States defense industry is experiencing frustration in agglomerating planned Department of Defense production requirements. One probable source of this frustration is inadequate requirement forecast consolidation by the Department of Defense. Several agencies within the Department of Defense are charged with procuring subassemblies and spares for major weapons systems. In the case of the United States Air Force F-16, the Air Force Logistics Command and the Air Force Systems Command are involved in formulation of production requirement forecasts, and may do so independent of one another. Defense suppliers are then subjected to a myriad of unconsolidated forecasts, none of which they can satisfy without significantly reducing their ability to fulfill other demand requirements. Methods, therefore, should be developed to improve the requirement forecast consolidation process. GRA

**N83-23273#** Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
**A STUDY TO DEMONSTRATE THE APPLICATION OF A GRAPHICAL METHOD TO DETERMINE AN OPTIMAL MAINTENANCE TASK INTERVAL FOR AN ITEM IN AIR FORCE INVENTORY M.S. Thesis**
Douglas C. Beckwith and Anthony R. Roclevitch Sep. 1982 213 p refs
(AD-A123025; AFIT-LSSR-60-82) Avail: NTIS HC A10/MF A01 CSCL 05/1

Determining maintenance task intervals is an important part of any schedule maintenance program. Criteria for determining optimal intervals is usually based on an objective function designed to minimize average long-term (expected) cost. This study demonstrates a graphical method, developed by Bergman in 1977, for determining a maintenance task interval using the KT-73 Inertial Measurement Unit installed on the A7-D. The method establishes intervals on a hard time replacement policy, but can also be used under an on-condition maintenance policy. The authors sought to discuss this study within the context of the Reliability-Centered Maintenance Program, but to deviate from the traditional age exploration concept and cost-benefit analyses. Instead, Bergman's simple, but rigorous, method is employed to find a task interval based on a control strategy which balances cost of replacement with cost of failure and results in a minimum total long-run average cost per unit time. Among the advantages of Bergman's method are that the underlying failure distribution need not be known and that a sensitivity analysis can be performed to examine the effects of cost uncertainty with regard to changes in the optimal interval. Author (GRA)

# 02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

**N83-23274*#** Notre Dame Univ., Ind. Dept. of Aerospace and Mechanical Engineering.
**THE STRUCTURE OF SEPARATED FLOW REGIONS OCCURRING NEAR THE LEADING EDGE OF AIRFOILS, INCLUDING TRANSITION Semiannual Status Report, Nov. 1982 - Apr. 1983**
Thomas J. Mueller Apr. 1983 17 p
(Grant NsG-1419)
(NASA-CR-170266; NAS 1.26:170266) Avail: NTIS HC A02/MF A01 CSCL 01A

Data was obtained for the NACA 663-018 airfoil in order to assess the advantages of tripping the boundary layer very near the leading edge for chord Reynolds numbers between 40,000 and 200,000. Single element trips were made from tape 2.5 mm wide and 0.15 mm thick. The unmodified tape trip in five thicknesses was placed across the span at 1.1% chord and the results of lift and drag measurements compared with the smooth airfoil case. Saw tooth geometry trips were also cut from tape and studied using five thicknesses. The saw tooth trips were placed across the span with the sharp points facing upstream at 1.1% chord and with the valley of the teeth at the 2.5% chord position. A large number of bumps and wiggles were produced in the lift coefficient versus angle of attack curves with various combinations of Reynolds number, thickness, and type of trips. The main result in the drag coefficient was an increase in C sub d min with increase in trip thickness. S.L.

**N83-23275*#** Textron Bell Helicopter, Fort Worth, Tex.
**EFFECTS OF AERODYNAMIC INTERACTION BETWEEN MAIN AND TAIL ROTORS ON HELICOPTER HOVER PERFORMANCE AND NOISE**
Ross P. Menger, Tommie L. Wood, and John T. Brieger Feb. 1983 343 p refs
(Contract NAS2-10771)
(NASA-CR-166477; NAS 1.26:166477) Avail: NTIS HC A15/MF A01 CSCL 01A

A model test was conducted to determine the effects of aerodynamic interaction between main rotor, tail rotor, and vertical fin on helicopter performance and noise in hover out of ground effect. The experimental data were obtained from hover tests performed with a .151 scale Model 222 main rotor, tail rotor and vertical fin. Of primary interest was the effect of location of the tail rotor with respect to the main rotor. Penalties on main rotor power due to interaction with the tail rotor ranged up to 3% depending upon tail rotor location and orientation. Penalties on tail rotor power due to fin blockage alone ranged up to 10% for pusher tail rotors and up to 50% for tractor tail rotors. The main rotor wake had only a second order effect on these tail rotor/fin interactions. Design charts are presented showing the penalties on main rotor power as a function of the relative location of the tail rotor. S.L.

**N83-23276#** Advisory Group for Aerospace Research and Development, Paris (France). Fluid Dynamics Panel.
**WIND TUNNEL FLOW QUALITY AND DATA ACCURACY REQUIREMENTS**

F. Steinle (NASA), E. Stanewsky (DFVLR-AVA), and R. O. Dietz, ed. Nov. 1982 35 p refs
(AGARD-AR-184; ISBN-92-835-1440-8) Copyright. Avail: NTIS HC A03/MF A01

Flow quality and data accuracy requirements for wind tunnel testing are discussed. The emphasis is on transonic test conditions. The current level of testing technology, the requirements for the future, and what needs to be done were considered. To aid in understanding the impact of flow quality and data accuracy, a detailed examination of their contributions to the test results of a transport-type configuration is included. The approach can be adapted to other types. The results of this effort correlate well with what is generally accepted. The result of this effort brought focus on the need to document the flow quality in each facility and that the measurements should include a standard set of both instrumentation and data reduction methods. Aside from the already well known need to improve angle of attack measuring capability, the need to understand the role of aeronoise on Reynolds number effects was highlighted. S.L.

**N83-23277#** Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Abteilsgemeinschaft Antriebsintegration.
**THE GENERATION OF HIGHER LEVELS OF TURBULENCE IN THE TEST SECTION OF THE HIGH SPEED CASCADE WIND TUNNEL, BRUNSWICK, FOR SIMULATION OF TURBOMACHINERY CONDITIONS**
Reinhard Kiock, Gerhard Laskowski, and Heinz Hoheisel Mar. 1982 55 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-815)
(DFVLR-FB-92-25) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 19,50

The flow through a turbomachine is characterized by a strong turbulence. Periodic velocity changes are superposed by stochastic velocity fluctuations, and the degree of turbulence achieves values up to 20%. A similar turbulence should be simulated at the investigation of cascades in the wind tunnel. For this purpose, turbulence was generated by grids of crossed bars in the High Speed Cascade Wind Tunnel Braunschweig. Now a turbine cascade can be investigated in its design point with a degree of turbulence of Tu sub 1 = 0.8%/3.1%/5.6% and 7.9% defined in the cascade inlet plane. Considerably higher values can be achieved only in the case of increasing inhomogenious distribution of dynamic head and turbulence across the test section. Author

**N83-23278#** Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
**PRELIMINARY RESULTS OF LDV SURVEYS IN THE COMPRESSIBLE LEADING EDGE VORTEX OF A DELTA WING**
G. Vorropoulos and J. F. Wendt Aug. 1982 60 p refs
(VKI-TN-137) Avail: NTIS HC A04/MF A01

Preliminary laser Doppler velocimetry surveys were performed in the lee-side vortex field on an AR = 2 sharp leading edge delta wing at 10 deg incidence and in the Mach number range from 0.4 to 1.0. It was possible to measure three velocity components. Compressibility effects were detected in both the vortex core position and in the behavior of a velocity component approximating the axial one. The problems encountered and associated errors are discussed and suggestions for future work are made. M.G.

**N83-23279#** Societe Nationale Industrielle Aerospatiale, Toulouse (France). Direction Etudes.
**THE EPSILON PROTOTYPE CORKSCREW PHENOMENON [LE PHENOMENE TIRE-BOUCHON SUR LE PROTOTYPE DE L'EPSILON]**
J. Irvoas 29 Sep. 1982 31 p In FRENCH Presented at 19th Colloq. d'Aerodyn. Appl., Marseille, 8-10 Nov. 1982; Sponsored by Association Aeronautique et Astronautique de France
(SNIAS-822-111-101) Avail: NTIS HC A03/MF A01

The prototype Epsilon was subject to oscillation, which occurred under large sideslip; longitudinal and lateral oscillations coupled together. It was due to a conjunction of circumstances: among them, the action of the propeller slipstream. Author

**N83-23280#** Aeronautical Research Inst. of Sweden, Stockholm. Dept. of Aerodynamics.
**AN EXPERIMENTAL INVESTIGATION OF THE INFLUENCE FROM CONTROLS ON SUPERSONIC AXISYMMETRIQUE FLOW OVER AFTERBODIES WITH A CENTERED PROPULSIVE JET**
Johan Agrell Nov. 1982 44 p refs Defence Material Administration
(Contracts FMV-F-FL-81713-74-013-07-001; FMV-F-FL-82223-76-001-21-001)
(FFA-TN-1982-50) Avail: NTIS HC A03/MF A01

Wind tunnel tests of the influence from controls on the pressure distribution on one cylindrical and two conical afterbodies were made at free stream Mach number 2.0 and zero angle of attack. A propulsive air jet with an exit Mach number 2.5 forced the flow to separate from the afterbody for high jet pressures. The results are presented in tabular form and as plotted pressure distributions which also were integrated to give the drag and the side force. The flow separation is studied from the pressure distribution as well as from selected oil flow and Schlieren photographs. The influence of deflected controls is large on the afterbody pressure distribution, on the location of the jet induced separation and on the level and the circumferential distribution of the base pressure. Author

# 03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

**N83-23281*#** Toledo Univ., Ohio. Dept. of Chemical Engineering.
**NUMERICAL SIMULATION OF AN ELECTROTHERMAL DEICER PAD M.S. Thesis. Final Report**
John J. Marano Mar. 1983 113 p refs
(Grant NAG3-72)
(NASA-CR-168097; NAS 1.26:168097) Avail: NTIS HC A06/MF A01 CSCL 01C

A numerical simulation is developed to investigate the removal of ice from composite aircraft blades by means of electrothermal deicing. The model considers one dimensional, unsteady state heat transfer in the composite blade-ice body. The heat conduction equations are approximated by using the Crank-Nicolson finite difference scheme, and the phase change in the ice layer is handled using the Enthalpy method. To solve the system of equations which result, Gauss-Seidel iteration is used. The simulation computes the temperature profile in the composite blade-ice body, as well as the movement of the ice-water interface, as a function of time. This information can be used to evaluate deicer performance. The simulation can also be used to solve a variety of other heat conduction problems involving composite bodies. Author

**N83-23282#** Radio Technical Commission for Aeronautics, Washington, D. C.
**EMERGENCY LOCATOR TRANSMITTER (ELT) EQUIPMENT INSTALLATION AND PERFORMANCE**
Nov. 1982 154 p refs
(RTCA/DO-182) Avail: NTIS HC A08/MF A01; Also available from Radio Technical Commission for Aeronautics Secretariat, One McPherson Square, Suite 500, 1425 K Street, N.W., Washington, D.C. 20005 at $16.00 per copy

Analysis of field data on emergency locator transmitter (ELT) performance, including false alarms, ELT deactivation and post-crash evaluation of ELT effectiveness; ELT placement, which includes mounting and activation studies; and ELT system performance, which includes the crash force sensor, batteries,

electronics, antenna and the performance of the search aircraft's receiver are investigated. Author

**N83-23283#** Duesseldorf Univ. (West Germany). Geographischen Inst.
**THE FLOW OF AIR-PASSENGER TRAFFIC IN THE FEDERAL REPUBLIC OF GERMANY WITH EMPHASIS ON AIRPORTS AND THEIR HINTERLAND**
Juergen Ernst Siebeck Jun. 1981 238 p refs In GERMAN; ENGLISH and FRENCH summaries
(Geographische-Schriften-18) Avail: NTIS HC A11/MF A01

The development of the geography of air transport and its evolution from transportation science and analysis of the passenger flows in the Federal Republic of Germany is reviewed. Passenger traffic through airports of origin and destination for the years 1971 and 1977 was calculated. The passenger/population ratios of the rural districts are compared with socioeconomic indicators of the same administrative units by correlation and regression analysis. The mapping of the residuals from the multiple regression shows a strong distance decay influence on the intensity of air traffic. The distribution of the air passengers at the different airports by origin and the number of regional air passengers at the airport for 1971 and 1977 are shown. The catchment areas of airports are the dynamic areal structures dependent on various factors. The evolution of traffic patterns reflects the different areal definitions of the catchment areas of airports. E.A.K.

**N83-23284#** Magnavox Government and Industrial Electronics Co., Mahwah, N. J. Electro-Optical Systems.
**CABLE AVOIDANCE STUDY Final Technical Report, 23 Sep. 1981 - 29 Oct. 1982**
Robert Hermes 29 Oct. 1982 39 p
(Contract DAAK70-81-C-0177)
(AD-A122917; EOSR-839) Avail: NTIS HC A03/MF A01 CSCL 01/4

The problem of real-time wire extraction from video scenes for helicopter navigation is addressed. A combination of semi-linear local line detectors and semi-local line discriminators is developed to optimize detection and false alarm rejection. While the results are quite good, further software development is indicated to improve both detection and noise rejection for pilot displays. Two directions for further development are suggested. A video tape demonstration of the current algorithm applied to scenes containing cables accompanies this report. Author (GRA)

**N83-23285#** Air Force Systems Command, Eglin AFB, Fla. Test Track Div.
**EJECTION SEAT TESTING FOR FEMALES Final Report, Nov. 1981 - Mar. 1982**
C. D. Gragg, Charles B. Evans, and Windell L. Gilliam 1 Nov. 1982 23 p refs
(AF Proj. 9993)
(AD-A122870; AD-TR-82-68) Avail: NTIS HC A02/MF A01 CSCL 01/3

Anthropometric data from a recent survey of female pilots was analyzed and compared with available DoD anthropometric surveys. The comparison showed the two populations to be of different distributions, pointing out the deficiency in using the DoD survey in designing escape system tests covering female aviators. Further, analysis of two existing anthropometric surveys of male aviators taken in 1950 & 1967 found a considerable change in seventeen years, indicating a need for a new survey of the contemporary population. Recommendations were made to change Military Standards and Specifications on ejection system and ejection systems testing to reflect inclusion of female aviators.
Author (GRA)

# 04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications.*

**N83-23286** Deutsche Lufthansa Aktiengesellschaft, Cologne (West Germany). Information und Dokumentation.
**FIELD THESAURUS OF AIR TRAFFIC AND FRINGES [FACHTESAURUS LUFTVERKEHR UND RANDGEBIETE]**
Hans-Juergen Curio, Hans Peter Koerner, Heinz-Dieter Marohn, Gudrun Gande, Ingrid Gebauer, and Maria Koerner Aug. 1980 633 p In GERMAN Prepared in cooperation with Tech. Univ., Berlin
Copyright. Avail: Issuing Activity

A thesaurus for air traffic and related areas is presented. The thesaurus, which is color coded, consists of the following sections: alphabetic descriptor index; descriptor supplement; subject tables; indexes of airlines; indexes of countries and traffic areas, traffic areas and geographic terminology; letter codes. Transl. by E.A.K.

**N83-23287#** Societe Nationale Industrielle Aerospatiale, Les Mureaux (France).
**AUTOMATIC LANDING IN BAD WEATHER CONDITIONS**
Y. Negre 1982 26 p
(SNIAS-822-111-106) Avail: NTIS HC A03/MF A01

The use of automatic landing has developed considerably, with the objective of reducing meteorological minima in order to increase flight regularity. At the present time, most systems are limited to values of mean wind announced by the control tower, which does not allow the system to be used in very rough weather; the pilot thus has to manage by himself. An interesting course is to promote automatic landing in all weather conditions, including very high wind. This course was opened up by Lockheed on the L.1011 which is equipped with a system called direct lift control which acts directly on the lifting surfaces and enables the aircraft to content with turbulence and windshear far more efficiently. Author

**N83-23288#** Federal Aviation Administration, Washington, D.C. Systems Research and Development Service.
**THE 3RD TRAFFIC ALERT AND COLLISION AVOIDANCE SYSTEM (TCAS) SYMPOSIUM**
1982 313 p Symp. held in Washington, D.C., 12-13 Oct. 1982
(AD-A123037; DOT/FAA/RD-82/75) Avail: NTIS HC A14/MF A01 CSCL 17/7

The Federal Aviation Administration held its third symposium on Traffic Alert and Collision Avoidance System (TCAS) in Washington, D.C., October 12-13, 1982, which was attended by representatives of organizations and airlines. This report contains twelve technical presentations describing the progress of the TCAS program. The TCAS will provide a range of capabilities and costs which will meet the requirements of all airspace users.
Author (GRA)

**N83-23289#** Naval Research Lab., Washington, D. C. Radar Analysis Branch.
**CRAB ANGLE ESTIMATION WITH TWO DIMENSIONAL CROSS CORRELATIONS AND CENTROIDS Final Report**
W. B. Gordon 14 Dec. 1982 19 p refs
(AD-A122872; AD-E000517; NRL-MR-4986) Avail: NTIS HC A02/MF A01 CSCL 17/9

This study is concerned with a high range resolution radar system for measuring the crab angle of landing aircraft. Previous attempts to measure the crab angle by means of one dimensional cross correlation techniques had proved to be unsuccessful, and the data from flight tests was examined to determine whether accurate estimates could be obtained by using two dimensional cross correlation techniques and centroids. Hundreds of different

types of estimators were examined, each one corresponding to different possibilities for data smoothing, data weighting, thresholding, and outlier removal; however, none of these methods produced satisfactory results. The probable cause for the poor performance was determined to be a lack of similarity in the returns from the two radars used in the system. The dissimilarity between the two returns was apparently caused by range differentials, aircraft roll, as well as the crab angle itself. GRA

**N83-23290#** Aeronautical Research Labs., Melbourne (Australia). Systems Dept.
**AN ANALYTICAL EVALUATION OF THREE VISUAL APPROACH SLOPE INDICATORS Interim Report**
Jane Millar Oct. 1982 17 p refs
(AD-A122973; ARL/SYS-TM-65) Avail: NTIS HC A02/MF A01 CSCL 01/5

This memorandum is intended as a concise summary of the major findings of an analytical review of published literature about three Visual Approach Slope Indicators; T-VASIS, Red-White VASIS and PAPI. Performance data, ergonomics of the designs and operational requirements of the landing aids are considered. This memorandum and the fuller report, currently in the process of publication, are part of an ARL series on related topics. GRA

**N83-23291#** National Range Operations Directorate, White Sands Missile Range, N. Mex. Data Sciences Div.
**POTENTIAL REDUCTION OF POSITION ESTIMATION ERROR FOR THE RMS/MTTS SYSTEM. THE USE OF AIRBORNE A-STATIONS**
William S. Agee and Robert H. Turner Oct. 1982 43 p refs
(AD-A122910; TR-82) Avail: NTIS HC A03/MF A01 CSCL 17/7

The position estimation errors using the range measurements from the RMS/MTTS system at MacGregor Range are evaluated. The potential reduction of the upward component of the position estimation errors obtained by adding one or more A-stations (measurement sites) attached to a tethered balloon is considered. Author (GRA)

# 05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

**N83-23292*#** System Planning Corp., Arlington, Va.
**REMOTELY PILOTED VEHICLE (RPV): PROPOSED COMMAND, CONTROL, COMMUNICATIONS (C3) STRUCTURE Final Report**
R. L. Hughes, W. K. Evans, W. G. Howard, and A. S. Wallace Jul. 1982 52 p refs Sponsored in part by NASA and Army Prepared for JPL, Calif. Inst. of Tech., Pasadena
(NASA-CR-170234; NAS 1.26:170234; SPC-819) Avail: NTIS HC A04/MF A01 CSCL 01C

The currently proposed command, control, and communications (C3) structure associated with the RPV system, potential problem areas in the transfer of information to and from the RPV system, and options for improving information transfer and estimate the degree of improvement to be expected were identified. Author

**N83-23293#** Aeronautical Research Labs., Melbourne (Australia).
**A MAXIMUM LIKELIHOOD PROGRAM FOR NON-LINEAR SYSTEM IDENTIFICATION WITH APPLICATION TO AIRCRAFT FLIGHT DATA COMPATIBILITY CHECKING**
R. A. Feik Jul. 1982 38 p refs
(AR-002-889; AERO-Note-411) Avail: NTIS HC A03/MF A01

A FORTRAN program was developed for the maximum likelihood estimation of parameters in nonlinear systems. An application of the program to compatibility checking of aircraft dynamic flight test data was studied. Using simulated time histories of longitudinal maneuvers, the conditions for satisfactory performance were identified. It is shown that for a practical maneuver shape, record length and sampling rate and for reasonable noise levels on the measured data, instrument errors can be identified to good accuracy and a set of compatible time histories reconstructed. Author

**N83-23294*#** Rockwell International Corp., Pittsburgh, Pa.
**HIMAT HIGHLY MANEUVERABLE AIRCRAFT TECHNOLOGY, FLIGHT REPORT**
[1982] 61 p
(NASA-CR-170245; NAS 1.26:170245; H1-9-17) Avail: NTIS HC A04/MF A01 CSCL 01C

Flight verification of a primary flight control system, designed to control the unstable HiMAT aircraft is presented. The initial flight demonstration of a maneuver autopilot in the level cruise mode and the gathering of a limited amount of airspeed calibration data. S.L.

**N83-23295*#** National Aeronautics and Space Administration, Washington, D. C.
**THE SOLAR AIRCRAFT**
Mar. 1983 13 p Transl. into ENGLISH from Flug Rev. Intern. (West Germany), no. 3, Mar. 1981 p 67-69 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3542)
(NASA-TM-77042; NAS 1.15:77042) Avail: NTIS HC A02/MF A01 CSCL 01C

A discussion is given in a popular manner of the solar powered aircraft Solair I. The achievements of the designer are detailed, and trial runs leading up to the first successful flight are given. Technical data of Solair I are listed, and brief news items about it are presented. Author

**N83-23296#** Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Helicopter and Transport Div.
**DEVELOPMENT OF A PASSIVE ROTOR ISOLATION SYSTEM FOR HELICOPTERS Final Report, Apr. 1982**
Dieter Braun Bonn Bundesministerium fuer Forschung und Technologie Dec. 1982 124 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-82-026; UD-347/82; ISSN-0170-1339) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 26

A passive multi-degree-of-freedom rotor isolation system which essentially consists of five uniaxial antiresonance force isolators was developed. Conventional and novel models of such isolator elements are presented. Sufficiently exact theoretical descriptions are developed for both isolator types. The effectiveness of the force isolators is proved by use of an uniaxial functional model. The function of the total rotor isolation system in the helicopter is tested by a shake test. The helicopter which is suspended by the rotor head is loaded by realistic rotor excitation forces and moments by use of suitably arranged electrodynamic shakers. The vibration isolation system is tested in flight. An excellent isolation efficiency is obtained. Author

**N83-23297#** National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.
**SOME METHODS FOR THE DERIVATION OF TAXIING LOADS FOR UNDERCARRIAGES WITH LINEAR OR NONLINEAR PROPERTIES**
R. Noback 22 Sep. 1980 54 p refs
(Contract NIVR-1947)
(NLR-TR-81110-U) Avail: NTIS HC A04/MF A01

Methods that are used for the establishment of taxiing loads are presented and discussed. The methods are straightforward for undercarriages with linear properties. For undercarriages with nonlinear properties methods based on the use of equivalent gains are promising, but still have to be verified. Author

**N83-23298#** National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.
**VERTICAL ACCELERATIONS OF A LARGE AIRCRAFT DURING LANDING AND TAXIING**
R. Noback 4 Jan. 1982 22 p refs
(Contract NIVR-1947)
(NLR-TR-82001-U) Avail: NTIS HC A02/MF A01

Vertical accelerations during landing and taxiing were extracted from the AIDS system, used by KSSU-Boeing 747 operators. Results are presented and compared with similar data from other sources. Author

**N83-23299#** Societe Nationale Industrielle Aerospatiale, Toulouse (France).
**PROPELLER MEAN SLIPSTREAM COMPUTATION. SLIPSTREAM INFLUENCE ON AIRCRAFT PERFORMANCES**
C. Kirrmann (Office National d'Etudes et de Recherches Aerospatiales, Leclerc, France), A. Rousseau (Societe Bertin et Cie, Plasir, France), and M. Yermia 1982 46 p In FRENCH; ENGLISH summary Presented at 19th Colloq. d'Aerodyn. Appl., Marseille, 8-10 Nov. 1982 Sponsored by Association Aeronautique et Astronautique de France
(SNIAS-822-111-104) Avail: NTIS HC A03/MF A01

The mean slipstream of a propeller was modeled by a potential flow panel method. The model was integrated into a complete 3D potential flow method program, which was used to evaluate the propeller slipstream effects on the performances of a commuter aircraft. S.L.

**N83-23300#** System Planning Corp., Arlington, Va.
**AERONAUTICAL STRUCTURES TECHNOLOGY STUDY: ANNOTATED BRIEFING REPORT**
R. B. Baird and J. C. Fish Sep. 1982 86 p refs
(Contract MDA903-82-C-0246; ARPA Order 3723)
(AD-A123064; SPC-850) Avail: NTIS HC A05/MF A01 CSCL 01/3

This document reports on quantitative and qualitative measures of benefit that were developed for use in determining the significance of aeronautical structures technology programs. The measures of benefit were developed for four categories: structures/materials, manufacturing, ownership, and operational, which represent the total life of an aircraft structure from initial design to final operation and ownership. The study also reports on two conceptual weapon systems, the Advanced Tactical Fighter and the Advanced Concepts Flight Vehicle; their operational and technical characteristics were determined for use in the subsequent analysis. The document includes recommendations on new structures technology initiatives that should be pursued for the conceptual weapon systems. Author (GRA)

**N83-23301#** Royal Aircraft Establishment, Farnborough (England).
**A COMPUTER-BASED SIMULATION OF A SIMPLE AIRCRAFT-TYPE FUEL SYSTEM. PART 1: NORMAL TRANSFER**
M. A. Beeny Mar. 1982 71 p refs
(AD-A123007; RAE-TM-FS(F)-466; DRIC-BR-84222) Avail: NTIS HC A04/MF A01 CSCL 09/2

A computer based model of a simple aircraft-type fuel system has been developed in Engineering Physics and latterly Flight Systems Department, Farnborough, RAE as a background activity over several years. This work was undertaken to furnish an emulation which could be useful for aircraft systems integration studies, to explore fuel management techniques and to furnish programming and documentation experience in an area which had previously relied upon conventional dc and ac signaling techniques. GRA

# 06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography.*

**N83-23302#** Ohio Univ., Athens. Dept. of Electrical Engineering.
**AN EXPERIMENTAL INVESTIGATION OF THE EFFICACY OF AUTOMATED WEATHER DATA TRANSMISSION TO AIRCRAFT IN FLIGHT Final Report**
Richard H. McFarland Washington FAA Dec. 1982 59 p refs
(FAA/PM-83/11; OU/AEC/EER-54-3) Avail: NTIS HC A04/MF A01

Results of a flight evaluation of a cockpit weather data device operating with actual weather are reported which indicate that valuable and useful weather information can be given automatically to the pilot in flight to aid his decision making. Both text and graphics were investigated and found to have the potential of increasing aircraft safety. Author

**N83-23303#** Aeronautical Research Labs., Melbourne (Australia).
**CLOUD LIQUID WATER CONTENT MEASURING EQUIPMENT FOR THE NOMAD N24 AIRCRAFT FLIGHT ICING TRIALS OF 1978-1979**
F. W. Skidmore, comp. and G. F. Pearce, comp. Sep. 1981 25 p refs
(ARL-Mech-Eng-Note-391; AR-002-903) Avail: NTIS HC A02/MF A01

This report describes spray rig tests on the liquid water content meters used in the Nomad N24 aircraft anti-icing trials held in 1978-1979. One instrument was based on a prototype designed by the CSIRO. A complete evaluation of this instrument was undertaken. The other was commercially available and accepted for flight icing trials use by the US Federal Aviation Authority and the Australian Department of Transport. Provided certain precautions were taken, both instruments performed satisfactorily over the range of liquid water contents and airspeeds required for Nomad certification. Author

**N83-23304#** AOA Apparatebau Gauting G.m.b.H. (West Germany).
**DIGITAL PRESSURE SENSOR FOR ALTIMETERS, RATE-OF-CLIMB AND AIR SPEED INDICATORS IN AIRCRAFTS Final Report, Dec. 1981**
Andreas Thoma Bonn Bundesministerium fuer Forschung und Technologie Dec. 1982 111 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-82-033; ISSN-0170-1339) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Ger. DM 23,50

A wave which is forced to be stationary in an acoustical resonator by two electroacoustic transducers and one PLL regenerative loop, shifts its resonance frequency when gas pressure is changed. This principle is used for the design of an analog as well as a digital operating altimeter and rate of climb indicator with a pressure altitude conversion integrated in the measuring principle. When the altitude changes by 9 km a change of the resonance frequency of 6,5 kHz with a linearity of 1,5% can be achieved. In a theoretical differentiation of the measuring effect, considering also the change of sound velocity and vibration absorption as well as the phase rotation of the electroacoustic transducer, influences such as the nature of gas and gas temperature are discussed. S.L.

# 07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

**N83-23305*#** Notre Dame Univ., Ind. Dept. of Electrical Engineering.
**ALTERNATIVES FOR JET ENGINE CONTROL Semiannual Status Report, 1 Oct. 1982 - 31 Mar. 1983**
Michael K. Sain Apr. 1983 102 p refs
(Grant NsG-3048)
(NASA-CR-170233; NAS 1.26:170233) Avail: NTIS HC A06/MF A01 CSCL 21E

Tensor model order reduction, recursive tensor model identification, input design for tensor model identification, software development for nonlinear feedback control laws based upon tensors, and development of the CATNAP software package for tensor modeling, identification and simulation were studied. The last of these are discussed. Author

**N83-23306*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
**DESIGN ANALYSIS OF A SELF-ACTING SPIRAL-GROOVE RING SEAL FOR COUNTER-ROTATING SHAFTS**
Eliseo DiRusso 1983 12 p refs Presented at the 19th Joint Propulsion Conf. and Tech. Display, Seattle, 27-29 Jun. 1983
(NASA-TM-83346; E-1253; NAS 1.15:83346) Avail: NTIS HC A02/MF A01 CSCL 21E

A self-acting spiral groove inter-shaft ring seal of nominal 16.33 cm (6.43 in.) diameter for sealing fan bleed air between counter rotating shafts in advanced turbofan engines was analyzed. The analysis focused on the lift force characteristics of the spiral grooves. A NASA Lewis developed computer program for predicting the performance of gas lubricated face seals was used to optimize the spiral groove geometry to produce maximum lift force. Load capacity curves (lift force as function of film thickness) were generated for four advanced turbofan engine operating conditions at relative seal speeds ranging from 17,850 to 29,800 rpm, sealed air pressures from 6 to 42 N/sq cm (9 to 60 psi) absolute and temperatures from 95 to 327 C (203 to 620 F). The relative seal sliding speed range was 152 to 255 m/sec (500 to 836 ft/sec). The analysis showed that the spiral grooves are capable of producing sufficient lift force such that the ring seal will operate in a noncontacting mode over the operating range of typical advanced turbofan engines. Author

**N83-23307#** Aeronautical Research Labs., Melbourne (Australia).
**PROPELLER POWER EFFECTS WITH WING FLAPS DEFLECTED**
C. A. Martin Oct. 1982 20 p refs
(ARL-AERO-Note-413; AR-002-916) Avail: NTIS HC A02/MF A01

A model of the dynamic motion of a single engine propeller driven aircraft was used to illustrate a longitudinal stability problem caused by the effects of power. In a recent general study on the effects of power the problem was shown to be due to changes in propeller slipstream dynamic head acting on a tailplane carrying a download. The problem is here studied in closer detail using the methods developed in the general study. A notable feature of the destabilizing effect is that it increases as c.g. moves forward and so opposes the conventional stabilizing effects associated with forward c.g. movement. Author

**N83-23308#** Michigan Univ., Ann Arbor. Dept. of Mechanical Engineering.
**EFFECT OF VOLATILITY ON AIR-FUEL RATION DISTRIBUTION AND TORQUE OUTPUT OF A CARBURETED LIGHT AIRCRAFT PISTON ENGINE Final Report**
Nat Won Sung, Kevin Morrison, and Donald J. Patterson Atlantic City, N.J. FAA Mar. 1982 36 p refs
(Contract DOT-FA79NA-6083)
(FAA-CT-82-117) Avail: NTIS HC A03/MF A01

A comprehensive sea level static test cell data collection and evaluation effort to review operational characteristics of a carbureted light aircraft piston engine as related to fuel volatility and air fuel ratio distribution to cylinders. Presented herein are results, data, and conclusions drawn from test cell engine operation on 100LL aviation grade fuel and various blends of automotive grade fuel. Sea level static test cell engine operations were conducted utilizing an AVCO Lycoming O-320 engine connected to an eddy current dynamometer which facilitated data collection under various engine load conditions. Test cell instrumentation was utilized to obtain operational data (temperatures, pressures, flow rates, torque, horsepower, exhaust emissions, etc.) from idle through cruise to maximum power with fuel grades having reid vapor pressure of 6.7, 11.7 and 14.0. The primary purpose of test cell engine operation was to observe real time performance characteristics associated with automotive grade fuel utilized by piston powered light general aviation aircraft. Author

**N83-23309*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
**EFFECT OF FLAMEHOLDER PRESSURE DROP ON EMISSIONS AND PERFORMANCE OF PREMIXED-PREVAPORIZED COMBUSTORS**
Robert A. Duerr and Valerie J. Lyons Apr. 1983 22 p refs
(NASA-TP-2131; E-1358; NAS 1.60:2131) Avail: NTIS HC A02/MF A01 CSCL 21E

Parametric tests were conducted to determine the effects of flameholder pressure drop on the emissions and performance of lean premixed-prevaporized combustors. A conical flameholder mounted in a diverging duct was tested with two values of flameholder blockage. Emissions of nitrogen oxides, carbon monoxide, carbon dioxide, and unburned hydrocarbons were measured for combustor entrance conditions of 600 to 800 K air temperature, 0.3 MPa to 0.5 MPa pressure, and 20 m/sec to 35 m/sec reference velocity. Jet A fuel was injected at flow rates corresponding to an equivalence ratio range from 0.8 down to the lean stability limit. Emission results for the high-blockage flameholder were a substantial improvement over the low-blockage emission results. A correlation of combustion efficiency with flameholder pressure drop was developed for pressure drops less than 9 percent. Author

**N83-23310*#** National Aeronautics and Space Administration, Washington, D. C.
**A SIMPLE PROPULSION SYSTEM MODEL FOR THE SIMULATION OF NONLINEAR DYNAMIC THRUST RESPONSE**
Gunther Schaenzer and Pater Krauspe Mar. 1983 11 p refs Transl. into ENGLISH from Z. fuer Flugwiss. und Weltraumforschung (West Germany), v. 2, no. 3, May - Jun. 1978 p 195-198 Transl. by Scientific Translation Service, Santa Barbara, Calif. Original doc. prep. by Technische Univ., Brunswick
(Contract NASw-3542)
(NASA-TM-77053; NAS 1.15:77053) Avail: NTIS HC A02/MF A01 CSCL 21E

A simple mathematical jet engine description is presented where the measured transition functions of the engine thrust can be simulated in a quasi-stationary operation as well as in acceleration or deceleration schedules. Because of its simplicity and high fidelity, it is especially suited for representing jet engines in digital simulation programs. Author

**N83-23311#** Motoren- und Turbinen-Union Muenchen G.m.b.H. (West Germany).
**ADVANCED COMPRESSOR COMPONENTS FOR AERO ENGINES. PHASE 2 (1980-1981) Final Report, May 1982**
Wolfgang Weiler, Helmut Jackwerth, Peter Schuster, and Herbert Merz Bonn Bundesministerium fuer Forschung und Technologie Dec. 1982 223 p refs In GERMAN; ENGLISH summary

Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-82-022; Tech-Bereicht-82/013; ISSN-0170-1339) Avail: NTIS HC A11/MF A01; Fachinformationszentrum, Karlsluhe, West Germany DM 40

Axial-centrifugal compressor, supercritical profiles for axial compressors, and high strength materials for compressors are discussed. Author

**N83-23312#** Detroit Diesel Allison, Indianapolis, Ind.
**INFLUENCE OF BLADE TIP CLEARANCE ON AERODYNAMICALLY INDUCED VIBRATION Final Report, 31 Aug. 1981 - 30 Sep. 1982**
James L. Bettner Oct. 1982 67 p refs
(Contract F49620-80-C-0078; AF Proj. 2307)
(AD-A123125; DDA-EDR-11257; AFOSR-82-1086TR) Avail: NTIS HC A04/MF A01 CSCL 21/5

An experimental investigation, whose objective was to demonstrate the influence of rotor blade tip clearance effects on the dynamic pressure induced on a downstream vane, was conducted in a large, low speed, single-stage research compressor. The blade tip clearance was 0.48% span. The rig was heavily instrumented with dynamic pressure gages on the vane hub, mean, and tip section suction and pressure surfaces. Author (GRA)

**N83-23313#** Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
**COST ANALYSIS OF TURBINE ENGINE WARRANTIES M.S. Thesis**
Greg T. Hellesto and Michael G. Oliverson Sep. 1982 193 p refs
(AD-A123034; AFIT-LSSR-85-82) Avail: NTIS HC A09/MF A01 CSCL 21/5

In the past, the commercial use of warranties for the purchase of turbine engines has proven cost effective. The use of warranties is now viewed by the Air Force as a viable procurement option for future Air Force turbine engine procurement. The Propulsion System Program Office (SPO) has investigated the use of warranties and recognizes the need for a system that can analyze the life cycle cost of an engine under warranty. This thesis shows the development of a decision support system in a computer model that assesses the turbine engine life cycle cost under warranty. Two versions of the warranty model were developed to provide short and long term warranty analysis and both systems were integrated into the total decision support system designed to assist SPO analysts and contract specialists to evaluate the cost effectiveness of a turbine engine warranty. Author (GRA)

**N83-23314#** Garrett Turbine Engine Co., Phoenix, Ariz.
**TPE331/T76 TURBOPROP PROPULSION ENGINE DURABILITY Final Technical Report**
Larry P. Wynn Wright-Patterson AFB, Ohio AFWAL Aug. 1982 176 p
(Contract F33615-81-C-5016; AF Proj. 2303)
(AD-A122962; GARRETT-21-3640(22); AFWAL-TR-82-4069) Avail: NTIS HC A09/MF A01 CSCL 21/5

This report on retirement-for-cause is based on the Garret TPE331/T76 turboprop engine second-stage turbine wheel. This second-stage turbine wheel is an integrally bladed wheel with continuous rim slots between each blade at the rim. The slot is ended with a circular hole. The slot and hole reduce thermal and centrifugal stresses existing at the heated outer rim and extend turbine low-cycle-fatigue life. This program was planned to develop criteria from examination and analysis of field service wheels that would allow the Air Force to define how much life remained in the wheel with an observed crack. The investigated wheel displayed significant scatter in cycles to initiate a given crack size. This scatter was traceable to the large variation in gran size at the rim of these cast integrally bladed wheels. Crack propagation analysis was able to predict the observed crack-growth rate. However, no correlation between crack initiation and usage could be identified during this program that would aid implementation of retirement-for-cause. GRA

**N83-23315#** Stanford Univ., Calif.
**TRANSITORY STALL IN DIFFUSERS Final Report, 1 Mar. 1979 - 30 Sep. 1982**
James P. Johnston 30 Dec. 1982 5 p refs
(Contract N00014-79-C-0255; Proj. SQUID)
(AD-A122953) Avail: NTIS HC A02/MF A01 CSCL 21/5

Diffusers have wide application as components of engines for flight vehicles, e.g., airbreathing engine inlets, compressor diffusers, transfer and interstage ducting and combustor inlet diffusers. Their function is to convert the kinetic energy in a high speed stream into static pressure rise with the least possible loss of energy, a process called recovery. Diffusers designed for high pressure recovery are generally close to a state of flow separation, or they already have some intermittent separation occurring in their boundary layers. GRA

# 08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

**N83-23316*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
**NASA/RAE COLLABORATION ON NONLINEAR CONTROL USING THE F-8C DIGITAL FLY-BY-WIRE AIRCRAFT Final Report**
G. F. Butler (RAE), M. J. Corbin (RAE), S. Mepham (RAE), J. F. Stewart, and R. R. Larson Feb. 1983 20 p refs
(NASA-TM-84296; A-9076; NAS 1.15:84296) Avail: NTIS HC A02/MF A01 CSCL 01C

Design procedures are reviewed for variable integral control to optimize response (VICTOR) algorithms and results of preliminary flight tests are presented. The F-8C aircraft is operated in the remotely augmented vehicle (RAV) mode, with the control laws implemented as FORTRAN programs on a ground-based computer. Pilot commands and sensor information are telemetered to the ground, where the data are processed to form surface commands which are then telemetered back to the aircraft. The RAV mode represents a singlestring (simplex) system and is therefore vulnerable to a hardover since comparison monitoring is not possible. Hence, extensive error checking is conducted on both the ground and airborne computers to prevent the development of potentially hazardous situations. Experience with the RAV monitoring and validation procedures is described. A.R.H.

**N83-23317*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
**STABILITY AND CONTROL OF A SUPERSONIC TRANSPORT AIRPLANE DURING LANDING APPROACH**
Waldo I. Oehman Apr. 1983 32 p refs
(NASA-TM-84659; NAS 1.15:84659) Avail: NTIS HC A03/MF A01 CSCL 01C

Modal control theory was applied to determine feedback gains that provide desirable stability characteristics and satisfactory transient response to aileron deflection input. However, the peak value of lateral acceleration at the pilot's station does not satisfy a proposed criterion during a rolling maneuver. Optimal regulator theory does not provide a significant reduction of the peak lateral acceleration. The weighting matrices in the performance index were given an extreme variation, but the effect on lateral acceleration remained insignificant. Open loop control provided the desired bank angle (30 deg) with the desired roll rate (10 deg/sec), and provided a satisfactory level of lateral acceleration. However, a large adverse sideslip angle was required. In addition, the yawing velocity was negative for about two seconds and lateral acceleration changed sign during the maneuver. The problem persists and perhaps relaxed criteria must be proposed. The criteria could allow any combination of a lower average rolling velocity, a larger adverse sideslip angle excursion, and a higher peak lateral acceleration at the pilot's station. S.L.

**N83-23318*#** Systems Technology, Inc., Mountain View, Calif.
**NON-INTRUSIVE PARAMETER IDENTIFICATION PROCEDURE USER'S GUIDE Final Report, Feb. - Jun. 1982**
Gregory D. Hanson and Wayne F. Jewell Apr. 1983 138 p refs (Contract NAS4-2941)
(NASA-CR-170398; NAS 1.26:170398; TR-1188-1) Avail: NTIS HC A07/MF A01 CSCL 01C

Written in standard FORTRAN, NAS is capable of identifying linear as well as nonlinear relations between input and output parameters; the only restriction is that the input/output relation be linear with respect to the unknown coefficients of the estimation equations. The output of the identification algorithm can be specified to be in either the time domain (i.e., the estimation equation coefficients) or in the frequency domain (i.e., a frequency response of the estimation equation). The frame length ('window') over which the identification procedure is to take place can be specified to be any portion of the input time history, thereby allowing the freedom to start and stop the identification procedure within a time history. There also is an option which allows a sliding window, which gives a moving average over the time history. The NAS software also includes the ability to identify several assumed solutions simultaneously for the same or different input data.
A.R.H.

**N83-23319#** Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
**THE OPEN LOOP GUST ALLEVIATION SYSTEM: OLGA Final Report, Dec. 1981**
Hartmut Boehret, Uwe Nortmann, Michael vonSarnowski, Wolfgang Wagner, and Horst Wuennenberg Bonn Bundesministerium fuer Forschung und Technologie Dec. 1982 86 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-82-030; ISSN-0170-1339) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Ger. DM 18

The application of a gust alleviation system on low wing loading aircraft, the open loop gust alleviation (OLGA) was examined. In the open loop principle the gust angle is calculated from the sensor signals and fed to the actuators which control the symmetric aileron and the elevator trim. The equipment sensors, processors, actuators are specified and tested in a comprehensive hardware simulation. The acceptance test is accomplished by this hardware simulation. The good performance of all systems with respect to their specification are demonstrated. E.A.K.

# 09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

**N83-23320** Flughafen, Frankfurt am Main (West Germany). Abt. Oeffentlichkeitsarbeit und Marktforschung.
**RUNWAY 18 WEST UNDER DISCUSSION. ON ICY WINDS IN THE AIRPORT CONTROVERSY [FLUGHAFENAUSBAU. STARTBAHN 18 WEST IN DER DISKUSSION. IM FLUGHAFENSTREI T WEHT EIN EISIGER WIND]**
Eugen Ernst Jan. 1982 22 p refs In GERMAN
(Fachthemen-1) Copyright. Avail: Issuing Activity

The ecological-economical controversy in the planning of the runway west (18-W) at the Rhine-Main Airport is discussed. The planning includes: the construction of a 4,000 m long, 45 m wide third runway, which includes the sacrifice of 350 ha (3.5 km2) of forest. The 18-W will cause an increase of noise for over 15,000 residents, who are living south of the airport, while it will relieve another 100,000 residents of noise. Opposing considerations related to the construction are outlined. On one hand, a 25% capacity increase and greater accuracy in air traffic, and on the other hand the stabilization of the Frankfurt airport as the third large employer in Hessen. Causes and development are outlined and the planned construction steps are evaluated.
Transl. by E.A.K.

**N83-23321** Flughafen, Frankfurt am Main (West Germany). Abt. Oeffentlichkeitsarbeit und Marktforschung.
**QUESTIONS AND ANSWERS CONCERNING RUNWAY 18 WEST [FRAGEN UND ANTWORTEN ZUR STARTBAHN 18 WEST]**
20 Feb. 1982 13 p In GERMAN
(Fachthemen-2) Copyright. Avail: Issuing Activity

The reasons for planning runway 18 west (18-W) at the Frankfurt/Main Airport are discussed. The German Federal Republic is dependent on its export industry and the Frankfurt Airport is the gate to the world. It is located in the center of Europe, which makes it one of the most important airports in world air traffic. As a passenger transport airport it ranks 13th in the world and fourth in cargo transport. For many years the airport is not able to fulfill its task adequately while the capacity of the available runways is run down. The 18-W runway was planned at the beginning of the 1960's. Opposing economical and ecological points of view are expressed and plans, claims and ideas concerning the construction of 18-W are outlined.
Transl. by E.A.K.

**N83-23322** Flughafen, Frankfurt am Main (West Germany). Abt. Oeffentlichkeitsarbeit und Marktforschung.
**THE RUNWAYS OF THE FRANKFURT MAIN AIRPORT: AIR TRAFFIC LIFELINES [DIE START- UND CANDEBAHNEN DES FLUGHAFENS FRANKFURT MAIN: LEBENSADERN DES LUFTVERKEHRS]**
Wolfgang Oberlist Jul. 1982 30 p refs In GERMAN
(Fachthemen-3) Copyright. Avail: Issuing Activity

The history of the Rhine-Main Frankfurt/Main airport is reviewed. The historical development of the landing strips and runways at the Rhine-Main airport is described. It is argued that an airport is never finished and the continuous need for maintenance and expansion of runways to fulfill the needs for modern air traffic are outlined. Transl. by E.A.K.

**N83-23323** Flughafen, Frankfurt am Main (West Germany). Abt. Oeffentlichkeitsarbeit und Marktforschung.
**MULTIPLICATION EFFECTS DUE TO WAGES, SALARIES AND COMMISSIONS PAID AT THE AIRPORT [MULTIPLIKATOREFFEKTE DURCH AM FLUGHAFEN AUSGEZAHLTE LOEHNE, GENAELTER UND AUFTRAGSSUMMEN]**
Feb. 1982 26 p refs In GERMAN
(Fachthemen-4) Copyright. Avail: Issuing Activity

The effects of capacity problems, traffic improvements, ratio of airline companies and the regional economy were considered for expansion plans of the Frankfurt/Main airport. Economic factors of the Frankfurt/Main airport were studied. It is shown that the regional economic multiplication effects of the airport can only be indicated by a mathematical mode. Transl. by E.A.K.

**N83-23324*#** National Aeronautics and Space Administration, Washington, D. C.
**A SURVEY OF THE THREE-DIMENSIONAL HIGH REYNOLDS NUMBER TRANSONIC WIND TUNNEL**
Kazuaki Takashima, Hideo Sawada, and Takeo Aoki Jun. 1982 88 p refs Transl. into ENGLISH of "Koku Uchi Gijutsu Kenkyujo Shiryo" rept. NAL-TM-440, Aug. 1981 38 p Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by National Aerospace Lab., Tokyo
(Contract NASw-3541)
(NASA-TM-76931; NAS 1.15:76931; NAL-TM-440) Avail: NTIS HC A05/MF A01 CSCL 14B

The facilities for aerodynamic testing of airplane models at transonic speeds and high Reynolds numbers are surveyed. The need for high Reynolds number testing is reviewed, using some experimental results. Some approaches to high Reynolds number testing such as the cryogenic wind tunnel, the induction driven

wind tunnel, the Ludwieg tube, the Evans clean tunnel and the hydraulic driven wind tunnel are described. The level of development of high Reynolds number testing facilities in Japan is discussed. Author

**N83-23325#** Purdue Univ., Lafayette, Ind. School of Civil Engineering.
**NON-CONTACT, NON-DESTRUCTIVE AIRPORT PAVEMENT PROFILE AND DEFLECTION MEASUREMENTS Final Report**
Milton E. Harr and David J. Elton Washington, D.C. FAA Jan. 1983 176 p refs
(FAA-PM-83-14) Avail: NTIS HC A09/MF A01

A noncontact, nondestructive method is described that allows the user to measure pavement texture and loaded and unloaded profiles from a moving vehicle. The device uses laser distance measuring gages. The gages are arranged such that their readings can be interpreted to give the loaded and unloaded pavement profiles and a measure of its texture. Four gages are mounted on a rigid beam that, in turn, is mounted on the side of a load vehicle. The gages read the distance to the pavement. Three of the gages are located outside the range of influence of the load wheel, and hence the pavement below these gages is undeflected. One of the gages is adjacent to the load wheel to measure the induced deflection. An algorithm is presented that relates all measurements to a common datum. The three gages yield readings that are interpreted to give the profile (do the surveying). The gages make so many readings and so quickly, that the standard deviation of the readings, taken over a short time period, gives a measure of the texture. A prototype device was constructed and tested. Author

**N83-23326*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
**DESIGN AND CONSTRUCTION OF 2 TRANSONIC AIRFOIL MODELS FOR TESTS IN THE NASA LANGLEY C.3-M TCT**
G. Schaechterle (DFVLR-AVA Goettingen), K.-H. Ludewig (DFVLR-AVA Goettingen), E. Stanewsky (DFVLR-AVA Goettingen), and E. J. Ray [1982] 28 p
(NASA-TM-85325; NAS 1.15:85325) Avail: NTIS HC A03/MF A01 CSCL 14B

As part of a NASA/DFVLR cooperation program two transonic airfoils were tested in the NASA Langley 0.3-m TCT. Model design and construction was carried out by DFVLR. The models designed and constructed performed extremely well under cryogenic conditions. Essentially no permanent changes in surface quality and geometric dimensions occurred during the tests. The aerodynamic results from the TCT tests which demonstrate the large sensitivity of the airfoil CAST 10-Z/DOAZ to Reynolds number changes compared well with results from other facilities at ambient temperatures. Author

**N83-23327#** Aeronautical Research Labs., Melbourne (Australia).
**THE ARL TRANSONIC WIND TUNNEL**
J. B. Willis Sep. 1982 36 p refs
(ARL-Aero-Note-412; AR-002-905) Avail: NTIS HC A03/MF A01

The ARL transonic wind tunnel is described. Originally built as a conventional subsonic highspeed tunnel it was converted in 1957 to transonic operation, and has been in operation since that time. It is a continuous flow, closed circuit tunnel with an electric drive system whose maximum power input is 2050 kw. The test section is 0 to 81 m high and 0 to 53 m wide. It is fitted with slotted walls and uses diffuser suction, covering a Mach number range of 0 to 4 to 1 to 4. Author

**N83-23328*#** National Aeronautics and Space Administration, Washington, D. C.
**TRANSONIC CRYOGENIC TEST SECTION FOR THE GOETTINGEN TUBE FACILITY**
H. Hornung, G. Hefer, P. Krogmann, and E. Stanewsky Mar. 1983 19 p refs Transl. into ENGLISH of "Transsonische Kryomesstrecke fuer den Goettinger rohrwindkanal" rept. IB-222-82A19, 3 May 1982 19 p Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by Aerodynamische Versuchsanstalt Goettingen, West Germany
(Contract NASw-3541)
(NASA-TM-77050; NAS 1.15:77050; IB-222-82A119) Avail: NTIS HC A02/MF A01 CSCL 14B

The design of modern aircraft requires the solution of problems related to transonic flow at high Reynolds numbers. To investigate these problems experimentally, it is proposed to extend the Ludwieg tube facility in Gottingen by adding a transonic cryogenic test section. After stating the requirements for such a test section, the technical concept is briefly explained and a preliminary estimate of concept is briefly explained and a preliminary estimate of the costs is given. Author

**N83-23329#** Toronto Univ. (Ontario). Inst. for Aerospace Studies.
**A PILOTED FLIGHT SIMULATOR STUDY OF CONFLICT OF INTEREST WIND MODELLING TECHNIQUES**
R. B. MacKenzie Nov. 1982 90 p refs Sponsored in part by Natural Sciences and Engineering Research Council
(UTIAS-TN-238; ISSN-0082-5263) Avail: NTIS HC A05/MF A01

Hazardous wind models synthesized using techniques based on differential games theory formalization of the conflict of interest between the wind and an aircraft on landing approach were implemented and evaluated on a fixed base flight simulator. This approach yields wind inputs that are dependent upon the aircraft state vector. Four wind models, formulated using two distinct techniques arising from the theory, were tested in a series of steep ILS approaches flown by two pilots. Evaluations were made of pilot performance and the severity and realism of the generated winds, then compared to results obtained in the presence of two reference wind profiles. Author

**N83-23330#** Logistics Management Inst., Washington, D. C.
**AH4 AUTOMATIC TEST EQUIPMENT REQUIREMENTS**
Frans Nauta Nov. 1982 91 p refs
(Contract MDA903-81-C-0166)
(AD-A122879; LMI-ML213-1) Avail: NTIS HC A05/MF A01 CSCL 01/3

The Army's new advanced helicopter, AH-64 relies on automatic test equipment (ATE) at aviation intermediate maintenance (AVIM) units for testing and diagnosis of faulty components removed from the aircraft. The Army is planning to provide one ATE station to each division and corps aviation brigade AVIM unit that supports the AH-64. Our independent analysis indicates that one ATE per AVIM may be sufficient only if the mean time between removal of AH-64 line replaceable units is 6 to 8 flying hours or greater, a figure that, though perhaps achievable, is twice that demonstrated so far in operational testing. GRA

**N83-23331#** Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
**A PROTOTYPE MODEL FOR THE DEVELOPMENT OF TRAINING SYSTEMS AND THE ACQUISITION OF AIRCREW TRAINING DEVICES FOR DEVELOPING WEAPON SYSTEMS M.S. Thesis**
William L. Goetz and Nelson O. Perez-Otero Sep. 1982 162 p refs
(AD-A123041; AFIT-LSSR-18-82) Avail: NTIS HC A08/MF A01 CSCL 05/9

The authors review the current method used by the Air Force to develop Training Systems and to acquire Aircrew Training Devices (ATDs), and they identify six limitations or problem areas. A review of Army and Navy ATD acquisition systems, as well as current literature, found no existing system which addressed all problems in existing systems. The authors develop a prototype system model for training and ATD development with proposed changes in four areas: management and personnel which includes centralization of decision making, development and retention of training development expertise, team concept, and collocation; information availability which includes access to prime contractor information and Generic Data Base (GDB) technology; contracting and delivery strategies which include scenario development, Pre-Planned Product Improvement, and using actual equipment or reduced fidelity ATDs for early training; Training System (TS)/ATD

Development Model which includes a graphic representation of the process to develop TS and ATD requirements. The authors validate the system model via expert opinion. Five of the six imitation areas were judged to be significantly improved by the system model. Author (GRA)

**N83-23332#** Associated Architects of Crested Butte, Colo.
**GUNNISON COUNTY AIRPORT TERMINAL Final Report**
Leen H. Waller and Jan F. Kreider (Kreider (Jan F.) and Associates, Inc.) 30 Nov. 1982 129 p refs
(Contract DE-FC02-80CS-30339; Proj. 339)
(DE83-004512; DOE/CS-30339/T1) Avail: NTIS HC A07/MF A01

The Gunnison Airport includes a number of solar and energy conservation features: south reflective surface for improved winter solar gain, Trombe wall, night setback, summer vent system, clerestory, high heat recovery ducts, task lighting, high levels of wall insulation, direct gain system and slab storage, operable windows, and airlock entries. After a summary of weather data collected in Gunnison, Colorado, the building performance is presented. The nature and magnitude of all connected loads at the airport are described, and the magnitude of solar contribution is evaluated and discussed using measured weather data. Performance prediction methods used during design are evaluated relative to their accuracy. Owner's and designers perspectives are presented, and information dissemination efforts are described. DOE

# 12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

**N83-23333*#** National Aeronautics and Space Administration, Washington, D. C.
**SECOND SHUTTLE JOIN NASA'S STS FLEET: CHALLENGER LAUNCHES FIRST NEW TRACKING SATELLITE**
[1983] 4 p refs
(NASA-TM-85306; MR-006; NAS 1.15:85306) Avail: NTIS HC A02/MF A01 CSCL 22A

NASA made a major stride in readying a second delivery vehicle for its Space Transportation System (STS) fleet with the perfect landing of Shuttle Orbiter Challenger at Edwards Air Force Base, California, April 9, 1983. Besides being the first flight test of Challenger's performance, the mission marked the orbiting of the first spacecraft in NASA's new Tracking and Data Relay Satellite System (TDRSS). The new family of orbiting space communications platforms is essential to serve future Shuttle missions. Although the Inertial Upper Stage (IUS) second stage engine firing failed to place TDRS in its final 35,888 kilometer (22,300 mile) geosynchronous orbit, its release from the orbiter cargo bay went as planned. Launch officials were confident they can achieve its planned orbit in a matter of weeks. Author

**N83-23334#** European Space Agency, Paris (France).
**GIOTTO MISSION**
[1982] 11 p Original document contains color illustrations
Avail: NTIS HC A02/MF A01

Measurement of the elementary and isotopic components of the cometary neutrals, ions, and dust particles, and provision of color photographs of Halley's comet is the purpose of the Giotto spacecraft. B.G.

**N83-23335#** Technische Univ., Berlin (West Germany). Inst. fuer Luft- und Raumfahrt.
**LUNAR BASE SIMULATION**
H. H. Koelle and B. Johenning 1 Nov. 1982 214 p refs
(ILR-Mitt-115/1982) Avail: NTIS HC A10/MF A01

The model of a lunar complex consisting of 20 elements is documented. The primary purpose of this system is the production of raw material, stock, parts and assemblies for the construction of space systems, such as solar space power plants or habitats. The model is described with all its relations and assumptions, several hundreds in number. The results of a standard run considering chemical propellants only, are given for a fifty years operational period on a basis of about 275 000 Mg lunar products p.a. on an average. This lunar base has an average mass of 12 400 Mg and an average crew of 650 during its life time. The cost of individual products are given as a function of time. Author

# 13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

No abstracts in this category.

# 14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air).*

No abstracts in this category.

# 15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

**N83-23336*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
**GRAVITY PROBE-B CONTROL SUBSYSTEM**
John Farmer Jan. 1983 46 p
(NASA-TM-82518; NAS 1.15:82518) Avail: NTIS HC A03/MF A01 CSCL 22B

The purpose of this document is to identify and briefly examine the control problems of the proposed Gravity Probe-B spacecraft. Suggestions are made for control thruster geometry, dynamics, and maximum output value. Maximum total thrust is also a consideration since all thrusters expel gaseous helium produced from a common liquid supply. Control philosophy and preliminary designs are presented for both the attitude and drag free control systems. A radial separation of the spacecraft center of mass and the center of the proof mass cavity produces cross coupling between the attitude and drag free systems. The low available thrust implies that this separation, throughout the mission, must be kept within very close tolerance and for this reason an onboard mass balance control system may be necessary. Simulation was performed only to the extent necessary to show the control concepts to be feasible. Author

**N83-23337#** European Space Agency, Paris (France).
**EXOSAT: THE EUROPEAN X-RAY OBSERVATORY SATELLITE**
[1982] 11 p refs Original document contains color illustrations
Avail: NTIS HC A02/MF A01

A detailed study of known X-ray sources is planned. The precise location of sources is determined with an accuracy of about ten seconds of arc using the two imaging telescopes and the medium energy experiment in conjunction with the lunar occultation mode (to an accuracy of about two seconds of arc). Diffuse extended

sources such as supernova remnants are mapped, and sources within nearby galaxies and galaxies within clusters are resolved using the imaging telescopes. Broad band spectroscopy is performed, i.e., the X-ray 'color' of sources are determined using the complete payload and high precision spectroscopy using transmission gratings with the imaging telescopes. The time variability of sources over time scales ranging from milliseconds to days is studied. Bursters, transients, pulsars, eclipsing binaries, and active galaxies are observed. S.L.

**N83-23338*** National Aeronautics and Space Administration, Washington, D. C.
**NASA NEWS**
22 Mar. 1983 21 p
(NASA-News-Release-83-35; P83-10046) Avail: NASA Scientific and Technical Information Facility, P.O. Box 8757, B.W.I. Airport, Md. 21240 CSCL 22A

The launch of NOAA E, an advanced TIROS N (ATN) environmental monitoring satellite, carrying special search and rescue instrumentation is announced. NOAA E carries instrumentation for a demonstration to search and rescue (SAR) mission agencies for evaluation of a satellite aided SAR system that may lead to the establishment of an operational capability. The ability of a spaceborne system to acquire, track and locate existing Emergency Locator Transmitters (ELTs) and Emergency Position Indicating Radio Beacons (EPIRBs) that are being used aboard general aviation and other aircraft, and ships, and are operating on 121.5 and 243 Megahertz frequencies is demonstrated. S.L.

**N83-23339#** Toronto Univ. (Ontario). Inst. for Aerospace Studies.
**ATTITUDE ESTIMATION FOR A BIAS-MOMENTUM GEOSYNCHRONOUS SATELLITE USING AN ADAPTIVE OBSERVER**
Janis Lea Campbell Mar. 1983 61 p refs
(UTIAS-TN-223; ISSN-0082-5263) Avail: NTIS HC A04/MF A01

Attitude estimation for a bias momentum geosynchronous satellite is investigated using a modification of the adaptive observer technique developed by Kreisselmeier. The unknown parameters are taken to be the offsets of the angular momentum vector along the roll and yaw axes. The results are compared with those obtained using a Luenberger observer. The modified adaptive observer gives good estimates for roll, roll rate, and pitch rate only. It is suggested that this is due to the low degree of observability of the yaw angle and yaw rate of this system. Author

**N83-23340#** Bonn Univ. (West Germany). Physikalisches Inst.
**STUDY OF MISSION PARAMETERS FOR AN ESA MARS GEOPHYSICAL ORBITER ("KEPLER") Final Report, Dec. 1981**
Ulf vonZahn and Wolfgang Kokott (MBB GmbH, Munich) Bundesministerium fuer Forschung und Technologie Dec. 1982 52 p Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-82-028; ISSN-0170-1339) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Ger. DM 11

In preparation for an ESA Accessment Study the parameters of a future Mars orbiter mission are investigated. In particular launch windows, interplanetary transfer orbits, Mars arrival dates and geometries, and Mars orbits are studied, some as function of particular launch windows. For the period 1986 through 1990 the areocentric elongation of Earth from Sun and the communication distance between Mars and Earth are calculated. It is concluded that the proposed mission could be performed using an ARIANE III launcher. Author

**N83-23341#** Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.
**SOUNDING ROCKET PROGRAM MAGNETOSPHERE. PROJECT PORCUPINE Final Report, Dec. 1979**
Bernd Haeusler, Gerhard Haerendel, Otto Bauer, Hermann Foeppl, Erich Rieger, Rudolf Treumann, and Arnoldo Valenzuela Bonn Bundesministerium fuer Forschung und Technologie Dec. 1982 221 p refs Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-82-029; ISSN-0170-1339) Avail: NTIS HC A10/MF A01; Fachinformationszentrum, Karlsruhe, West Ger. DM 39

The scientific background and objectives of the PORCUPINE sounding rocket project are discussed. An overview of the course of the project including the IMS-Aries development phase and the main technical aspects of the payloads and its instruments and experiments are provided. Major scientific results in the field of auroral processes and active plasma experiments are presented. Author

**N83-23342#** Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Raumfahrt.
**SOUNDING ROCKET PROGRAM AERONOMY. PROJECT: ENERGY BUDGET PAYLOAD E2 Final Report, Mar. 1982**
Heinz Auchter, Guenter Hummelten, Hermann Waldmann, and Helmut Zarzycki Bonn Bundesministerium fuer Forschung und Technologie Dec. 1982 179 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-82-031; ISSN-0170-1339) Avail: NTIS HC A09/MF A01; Fachinformationszentrum, Karlsruhe, West Ger. DM 34,50

The identical payloads were equipped with five experiments, an attitude control system and a recovery system for salvage over land. The sounding rocket motors were of the type Skylark 7. The technical function of the payload system was to fulfill three main requirements: the experiments had to be put in the required measuring position, the measuring data had to be transmitted to the ground, the experiment EW11 had to be salvaged in a good condition together with the whole payload. The essential project activities are described from the payload supplier's point of view and the technical payload flight data are summarized. The recovery payloads are analyzed with respect to re-use of them. Author

**N83-23343#** Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Raumfahrt.
**SPACE PLATFORMS FOR LOW EARTH AND FOR GEOSTATIONARY ORBITS WITH INTEGRATED TRANSFER SYSTEM Final Report, Feb. 1982**
Dietrich E. Koelle and Wolfgang Kleinau Bonn Bundesministerium fuer Forschung und Technologie Dec. 1982 328 p refs Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-82-032; ISSN-0170-1339) Avail: NTIS HC A15/MF A01; Fachinformationszentrum, Karlsruhe, West Ger. DM 49,50

The technical, operational, programmatic and economic aspects of Shuttle optimized space platforms as a concept of orbital systems is reviewed. Reusable platforms for LEO (low Earth orbits), a concept which reduces the spacecraft cost to about 50% of the conventional expendable satellite approach are studied. As examples the following concepts are investigated: an astroplatform (for X-ray and IR-telescope missions), a microgravity platform for space processing and a remote sensing platform for dedicated commercial missions. A geosynchronous communication platform is analyzed in detail: the geoplatform is characterized by a substantially higher performance than conventional satellites and at the same time much lower launch cost. This is achieved by an integrated propulsion system which allows the platform to propel itself from LEO to GEO ('eigentransfer') without an additional expensive propulsion stage. S.L.

**N83-23344#** Naval Research Lab., Washington, D. C. Center for Space Research.
**THE NRL SOLRAD 11 SATELLITES (1976-023C, 1976-023D) DESCRIPTION OF EXPERIMENTS Final Report**
D. M. Horan, R. W. Kreplin, and K. P. Dere 30 Nov. 1982 71 p refs
(AD-A122866; AD-E000516; NRL-MR-4959) Avail: NTIS HC A04/MF A01 CSCL 22/1

The Naval Research Laboratory's SOLRAD 11 satellites were successfully launched on 15 March 1976. The two satellites each carried an identical complement of 25 experiments to measure solar electromagnetic and charged particle emissions, Earth auroral and stellar X-ray emission, terrestrial and interplanetary extreme ultraviolet emission, X-ray and charged particle emission from the anti-solar direction, and gamma ray bursts. This report provides general descriptive information on the satellites and their sensors. GRA

**N83-23345#** Los Alamos Scientific Lab., N. Mex.
**THE ROLE OF NUCLEAR REACTORS IN FUTURE MILITARY SATELLITES**
David Buden and Joseph A. Angelo, Jr. 1982 19 p Presented at the 8th DARPA Strategic Space Symp., Monterey, Calif., 22-25 Jun. 1982
(Contract W-7405-eng-36)
(DE82-018381; LA-UR-82-1649; CONF-820665-1) Avail: NTIS HC A02/MF A01

Future military capabilities should certainly be profoundly influenced by emerging shuttle era space technology. Regardless of the specific direction or content of tomorrow's military space program, it is clear that advanced space transportation systems, orbital support facilities, and large-capacity power subsystems are needed to create the generally larger, more sophisticated military space systems of the future. The critical role that space nuclear reactors should play in America's future space program are explored and the current state of nuclear reactor power plant technology is reviewed. Space nuclear reactor technologies have the potential of satisfying power requirements ranging from 10 kW/sub (e)/ to 100 MW/sub (e)/. DOE

# 16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation, e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

No abstracts in this category.

# 17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications.*

No abstracts in this category.

# 18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics.*

**N83-23346*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
**ABLATION OF CARBONACEOUS MATERIALS IN A HYDROGEN-HELIUM ARC-JET FLOW**
C. Park, J. H. Lundell, M. J. Green, W. Winovich, and M. A. Covington Mar. 1983 14 p refs
(NASA-TM-84346; A-9286; NAS 1.15:84346) Avail: NTIS HC A02/MF A01 CSCL 11D

The stagnation-point ablation rates of a graphite, a carbon-carbon composite, and four carbon-phenolic materials are measured in an arc-jet wind tunnel with a 50% hydrogen-50% helium mixture as the test gas. Flow environments are determined through measurements of static and impact pressures, heat-transfer rates to a calorimeter, and radiation spectra, and through numerical calculation of the flow through the wind tunnel, spectra, and heat-transfer rates. The environments so determined are; impact pressure approx. 3 atm, Mach number approx. 2.1, convective heat-transfer rate approx. 14 kw/sq cm, and radiative heat-transfer rate approx. 7 kw/sq cm in the absence of ablation. Ablation rates are determined from the measured rates of mass loss and recession of the ablation specimens. Compared with the predicted ablation rates obtained by running RASLE and CMA codes, the measured rates are higher by about 15% for all tested materials. Author

**N83-23347*#** Pennsylvania State Univ., University Park. Dept. of Physics.
**MASS ANALYSIS OF NEUTRAL PARTICLES AND IONS RELEASED DURING ELECTRICAL BREAKDOWNS ON SPACECRAFT SURFACES Semiannual Status Report, 4 Sep. 1982 - 3 Mar. 1983**
B. R. F. Kendall 21 Apr. 1983 18 p refs
(Grant NsG-3301)
(NASA-CR-170299; NAS 1.26:170299; SASR-7) Avail: NTIS HC A02/MF A01 CSCL 22B

A specialized spectrometer was designed and developed to measure the mass and velocity distributions of neutral particles (molecules and molecular clusters) released from metal-backed Teflon and Kapton films. Promising results were obtained with an insulation breakdown initiation system based on a moveable contact touching the insulated surfaces. A variable energy, high voltage pulse is applied to the contact. The resulting surface damage sites can be made similar in size and shape to those produced by a high voltage electron beam system operating at similar discharge energies. The point discharge apparatus was used for final development of several high speed recording systems and for measurements of the composition of the materials given off by the discharge. Results with this apparatus show evolution of large amounts of fluorocarbon fragments from discharge through Teflon FEP, while discharges through Kapton produce mainly very light hydrocarbon fragments at masses below about 80 a.m.u. A.R.H.

**N83-23348*#** National Aeronautics and Space Administration, Washington, D. C.
**THERMAL PROTECTION IN SPACE TECHNOLOGY**
G. M. Salakhutdinov Oct. 1982 73 p Transl. into ENGLISH from Novoye v Zhizni, Nauke, Tekhn. Ser. Kosmonavtika, Astron. (Moscow), no. 7, 1982 p 1-58 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(NASA-TM-77145; NAS 1.15:77145) Avail: NTIS HC A04/MF A01 CSCL 22B

The provision of heat protection for various elements of space flight apparata has great significance, particularly in the construction of manned transport vessels and orbital stations. A popular explanation of the methods of heat protection in rocket-space technology at the current stage as well as in perspective is provided. Author

**N83-23349#** Toronto Univ. (Ontario). Inst. for Aerospace Studies.
**GRAVITATIONAL ORBIT-ATTITUDE COUPLING AND PENUMBRAL SOLAR-GRADIENT TORQUES FOR VERY LARGE SPACECRAFT Thesis**
Glen Barry Sincarsin Nov. 1982 378 p refs Sponsored by Natural Sciences and Engineering Research Council

(UTIAS-265; ISSN-0082-5255) Avail: NTIS HC A17/MF A01

General equations of motion are derived that govern the gravitationally coupled orbit attitude motion of very large spacecraft. The force and torque caused by solar radiation pressure are also considered. The gravitational force and torque are expanded in Taylor series in the small ratio (spacecraft size/orbital radius) and terms up to fourth order are retained. The expressions are fully nonlinear in the attitude variables. Expressions derived for the solar force and torque include a light intensity function, expanded in a Taylor series, which models the effects of spacecraft eclipsing by the Earth. In particular, a solar gradient term is retained. The general equations are specialized to a planar form spacecraft configuration; however, they remain general enough to represent any triaxially symmetric spacecraft possessing a uniform mass distribution. A computer simulation based on these equations is prepared and shown to reproduce satisfactorily selected results from the literature. Author

# 19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography.*

**N83-23350*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

**ABATEMENT OF GASEOUS AND PARTICULATE CONTAMINATION IN A SPACE INSTRUMENT APPLICATION TO A SOLAR TELESCOPE**

John J. Scialdone Apr. 1983 11 p refs Presented at the AIAA 18th Thermophys. Conf., Montreal, 1-3 Jun. 1983 Submitted for publication

(NASA-TM-85016; NAS 1.15:85016) Avail: NTIS HC A02/MF A01 CSCL 14B

Methods to prevent the ingestion of external contaminants into the instrument and to limit the effect of the self-generated contaminants during ground, launch, orbiting and landing phases of flight were investigated. It is proposed that a positive pressure and purging flow of clean gas inside the instrument be maintained while on the ground, during launch, and for a period of time in orbit. The pressure to be maintained and the required purging flow are examined in terms of the effectiveness in preventing gaseous and particulate contaminants ingestion and the abatement of the self-generated contaminants. Considerations have been given to the venting requirements for the structural integrity of the instrument during launch, the limitations on the volume and the pressure of the purging gas to be carried along in orbit, and the required venting area is established based on the internal volume of the instrument, the allowable pressure differential, and the rate of external pressure change during launch. B.W.

# 20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

**N83-23351*#** Continuum, Inc., Huntsville, Ala.

**AN INVESTIGATION OF EQUILIBRIUM CONCEPTS Final Report**

R. J. Prozan 15 Oct. 1982 23 p refs

(Contract NAS8-34946)

(NASA-CR-170732; NAS 1.26:170732; CTI-TR-0066) Avail: NTIS HC A02/MF A01 CSCL 21H

A different approach to modeling of the thermochemistry of rocket engine combustion phenomena is presented. The methodology described is based on the hypothesis of a new variational principle applicable to compressible fluid mechanics. This hypothesis is extended to treat the thermochemical behavior of a reacting (equilibrium) gas in an open system. Author

**N83-23352#** Aerospace Corp., El Segundo, Calif. Chemistry and Physics Lab.

**DETECTION OF HIGH-ALTITUDE MISSILE EXHAUST PLUMES AT SUBMILLIMETER WAVELENGTHS**

Glenn C. Light and Paul F. Zittel 25 Oct. 1982 92 p refs

(Contract F04701-82-C-0083)

(AD-A122888; TR-0083(3945-04)-1; SD-TR-82-84) Avail: NTIS HC A05/MF A01 CSCL 17/9

Studies are described of the detectability of low-thrust, high-altitude rocket motor plumes based on observation of their optical properties at submillimeter wavelengths. The report describes the physical and optical model for a high-altitude plume. The model includes a first approximation for the the effects of interaction with a tenuous atmosphere. Results are presented for plume signature and its dependence on motor and plume parameters and on viewed-scene variables. A signal-to-noise calculation is presented. Author (GRA)

# 23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

**N83-23353#** Ames Lab., Iowa. Dept. of Chemistry.

**FLUORESCENCE-LINE-NARROWING SPECTROMETRY OF POLYCYCLIC AROMATIC HYDROCARBONS IN ORGANIC GLASSES Ph.D. Thesis**

Johnie Charles Brown Jul. 1982 247 p refs

(Contract W-7405-eng-82)

(DE83-004960; IS-T-988) Avail: NTIS HC A11/MF A01

Fluorescence line narrowing spectrometry (FLNS), also known as optical site selection spectroscopy, is a relatively new technique holding great promise as an analytical tool. Species specific analysis of complex samples for low concentrations of polycyclic aromatic hydrocarbons (PAHs) is a difficult analytical problem. The PAH analysis problem is reviewed herein as are the mechanisms and characteristics of FLNS which make this new methodology appear ideal for application to the problem. Organic glasses are presented as the cryogenic matrices of choice for analytical FLNS. An experimental arrangement utilizing sensitive gated signal detection is used to test the analytical utility of FLNS. Data presented show that linear quantitative response from concentrations between saturation (about 1 ppM) and the low parts per trillion range is obtained. The demonstrated high precision and linearity of response show that routine analytical FLNS using organic glass matrices need not use internal standard and/or standard addition quantitation schemes. Unambiguous determinations of compounds in complex samples are shown to be expected. DOE

**N83-23354#** Western Technologies, Inc., Phoenix, Ariz.

**CHEMICAL AND PHYSICAL PROPERTIES OF ASPHALT-RUBBER MIXTURES, PHASE 3 Final Summary Report, Jun. 1978 - Apr. 1982**

J. C. Rosner and J. G. Chehovits Federal Highway Administration Jun. 1982 92 p refs Sponsored in part by the Arizona Dept. of Transportation 6 Vol.

(PB83-121806; FHWA/AZ-82/159) Avail: NTIS HC A05/MF A01; also available in set of 6 reports HC E99 as PB83-121798 CSCL 13C

An extensive statistically designed laboratory investigation which had objectives of evaluating effects of asphalt-rubber components on mixture properties, effects of diluent on mixture properties, effects of temperature on mixture properties, applicability of several test procedures for asphalt rubber mixtures, and differences between field and lab produced asphalt-rubber mixtures

was performed. Asphalt-rubber materials formulated with six rubber types from two different production processes, four rubber concentrations, four asphalts and four diluent concentrations were produced and tested. Field produced mixtures were obtained from experimental asphalt-rubber field projects in Arizona. Testing procedures included absolute viscosity, Schweyer rheometer, sliding plate microviscometer, force-ductility, and viscosity during mixing. GRA

**N83-23355#** Western Technologies, Inc., Phoenix, Ariz.
**CHEMICAL AND PHYSICAL PROPERTIES OF ASPHALT-RUBBER MIXTURES, PHASE 3. VOLUME 1: EFFECTS OF RUBBER TYPE, CONCENTRATION AND ASPHALT Final Report, Jun. 1978 - Apr. 1982**
J. C. Rosner and J. G. Chehovits Phoenix, Ariz. Federal Highway Administration Jun. 1982 620 p refs Sponsored in part by the Arizona Dept. of Transportion 6 Vol.
(PB83-121814; FHWA/AZ-82/159/1) Avail: NTIS HC A99/MF A01; also available in set of 6 reports HC E99 as PB83-121798 CSCL 13C

This study had the objectives of (1) evaluating the effects of major components, rubber and asphalt, on physical properties of asphalt-rubber mixtures, and (2) evaluating the feasibility of using testing procedures studied for specifying asphalt-rubber mixtures. Forty-eight different asphalt-rubber mixtures formulated with six different rubber types at four concentrations with two asphalts were tested. Testing procedures utilized included absolute viscosity at 140 F, Schweyer Rheometer and force-ductility at 39.2 F, sliding plate microviscometer at 32.0 F, and viscosity by the Torque-Fork and Haake viscometer during mixing at 375 F. All mixtures were produced in a Torque-Fork mixter at 375 F using a 1 hour mixing duration. A total of 31 measured or calculated parameters are reported and discussed. GRA

**N83-23356#** Western Technologies, Inc., Phoenix, Ariz.
**CHEMICAL AND PHYSICAL PROPERTIES OF ASPHALT-RUBBER MIXTURES, PHASE 3. VOLUME 2: EFFECTS OF ASPHALT Final Report, Jun. 1978 - Apr. 1982**
J. C. Rosner and J. G. Chehovits Phoenix, Ariz. Federal Highway Administration Jun. 1982 111 p refs Sponsored in part by the Arizona Dept. of Transportation 6 Vol.
(PB83-121822; FHWA/AZ-82/159/2) Avail: NTIS HC A06/MF A01; also available in set of 6 reports HC E99 as PB83-121798 CSCL 13C

The effects of asphalt characteristics on physical properties of asphalt-rubber mistures were evaluated. Sixteen different asphalt rubber mixtures formulated with 2 different asphalts and additions of extender oil (making a total of 4 different binders), and 2 types of granulated reclaimed rubber at 20 and 25 percent concentrations were studied. Testing procedures utilized included absolute viscosity at 140 F, Schweyer Rheometer and force-ductility at 39.2 F, and viscosity during mixing by the Torque-Fork and Haake visometer All mixtures were produced in the Torque-Fork mixer at 375 F using a 1 hour mixing duration. A total of 17 measured or calculated parameters are reported and discussed. GRA

**N83-23357#** Western Technologies, Inc., Phoenix, Ariz.
**CHEMICAL AND PHYSICAL PROPERTIES OF ASPHALT-RUBBER MIXTURES, PHASE 3. VOLUME 3: EFFECTS OF DILUENT Final Report, Jun. 1978 - Apr. 1982**
J. C. Rosner and J. G. Chehovits Phoenix, Ariz. Federal Highway Administration Jun. 1982 136 p refs Sponsored in part by the Arizona Dept. of Transportation 6 Vol.
(PB83-121830; FHWA/AZ-82/159/3) Avail: NTIS HC A07/MF A01; also available in set of 6 reports HC E99 as PB83-121798 CSCL 13C

The effects of diluent additions and curing time after diluent addition on physical properties of asphalt rubber mixtures was studied. A single asphalt rubber mixture composed of AR1000 asphalt and 25 percent Atlos TP044 rubber was studied. Four different percentages of diluent (Kerosene) and five different curing times at 140 F were considered. Testing procedures utilized included ring and ball softening point, Schweyer Rheometer and force ductility at 39.2 F, and viscosity during mixing at 373 F by Torque-Fork and Haake viscometer. A total of 17 measured or calculated parameters are reported and discussed. GRA

**N83-23358#** Western Technologies, Inc., Phoenix, Ariz.
**CHEMICAL AND PHYSICAL PROPERTIES OF ASPHALT-RUBBER MIXTURES, PHASE 3. VOLUME 4: PHYSICAL PROPERTIES OF FIELD-MIXED ASPHALT-RUBBER MIXTURES AND COMPARISON OF LAB AND FIELD-MIXED ASPHALT RUBBERS Final Report, Jun. 1978 - Apr. 1982**
J. C. Rosner and J. G. Chehovits Phoenix, Ariz. Federal Highway Administration Jun. 1982 93 p refs Sponsored in part by the Arizona Dept. of Transportation 6 Vol.
(PB83-121848; FHWA/AZ-82/159/4) Avail: NTIS HC A05/MF A01; also available in set of 6 reports HC E99 as PB83-121798 CSCL 13C

Eight asphalt rubber samples from commercial field produced asphalt rubber mixtures were tested using absolute viscosity, Schweyer Rheometer, force ductility, softening point, and low temperature fracture procedures. Mixtures were produced by two major suppliers of asphalt rubber. Properties of the field produced asphalt rubbers are compared. Additionally, properties of the field produced mixtures are compared to those of comparable asphalt rubber mixtures produced in the laboratory using the Torque-Fork. GRA

**N83-23359#** Western Technologies, Inc., Phoenix, Ariz.
**CHEMICAL AND PHYSICAL PROPERTIES OF ASPHALT-RUBBER MIXTURES, PHASE 3. VOLUME 5: EFFECT OF TEMPERATURE Final Report, Jun. 1978 - Apr. 1982**
J. C. Rosner and J. G. Chehovits Federal Highway Administration Jun. 1982 91 p refs Sponsored in part by the Arizona Dept. of Transportation 6 Vol.
(PB83-121855; FHWA/AZ-82/159/5-Vol-5) Avail: NTIS HC A05/MF A01; also available in set of 6 reports HC E99 as PB83-121798 CSCL 13C

The effects of temperature on physical properties of asphalt-rubber mixtures were evaluated. Eight different asphalt-rubber mixtures formulated with two different asphalts and two types of granulated reclaimed rubber at 20 and 25 percent concentrations were studied. These mixtures were comparable to mixtures supplied by two of the major asphalt-rubber producers. These mixtures were tested at three different temperatures - 77 F (25 C), 39.2 F (4 C), and -20 F(-29 C). GRA

# 24 COMPOSITE MATERIALS

Includes laminates.

**N83-23360*#** Materials Sciences Corp., Spring House, Pa.
**DEVELOPMENT OF AN ANALYTIC PROCEDURE TO CALCULATE DAMAGE ACCUMULATION IN COMPOSITES DURING LOW VELOCITY IMPACT Final Contractor Report, 3 Aug. 1979 - 15 Apr. 1983**
E. A. Humphreys and J. Goering Feb. 1983 86 p refs
(Contract NAS1-15888)
(NASA-CR-166086; NAS 1.26:166086; MSC-TFR-1315-0208) Avail: NTIS HC A05/MF A01 CSCL 11D

A computerized procedure was developed to model the response of a laminated composite plate subjected to low velocity impact. The methodology incorporated transient dynamics finite element analysis coupled with composite layer and interlaminar stress predictions. Damage was predicted using a stress based failure criteria and incorporated into the solution as stiffness modifications. The force-displacement relation between the impactor and plate was modelled with a nonlinear contact spring similar to Hertzian contact. Analyses performed predicted ply damage early in the impact event when the displacement fields were characteristic of high frequency flexurable response. Author

**N83-23361*#** National Aeronautics and Space Administration, Washington, D. C.

**STRENGTH CRITERIA FOR COMPOSITE MATERIALS (A LITERATURE SURVEY)**
F. Roode Dec. 1982 51 p refs Tranl. into ENGLISH of "Sterktecriteria voor Composietmaterialen (een Literatuur Overzicht)" rept. IWECO-5071104-80-1, TDCK-75128, Delft, Jan. 1980 46 p Transl. by Scientific Translation Service, Santa Barbara, Calif. Original doc. prep. by Inst. TNO voor Werktuigkundige Constructies, Delft
(Contract NASw-3542)
(NASA-TM-77001; NAS 1.15:77001; IWECO-50771104-80-1; TDCK-75128) Avail: NTIS HC A04/MF A01 CSCL 11D

Literature concerning strength (failure) criteria for composite materials is reviewed with emphasis on phenomenological failure criteria. These criteria are primarily intended to give a good estimation of the safety margin with respect to failure for arbitrary multiaxial stress states. The failure criteria do not indicate the types of fracture that will occur in the material. The collection of failure criteria is evaluated for applicability for the glass reinforced plastics used in mine detectors. Material tests necessary to determine the parameters in the failure criteria are discussed.
Author

**N83-23362#** National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.
**THE EFFECT OF IMPACT DAMAGE ON THE TENSION-COMPRESSION FATIGUE PROPERTIES OF SANDWICH PANELS WITH FACE SHEETS OF CARBON/EPOXY**
W. G. J. tHart Dec. 1981 36 p refs
(Contract NIVR-1744)
(NLR-TR-82002-U) Avail: NTIS HC A03/MF A01

The effect of low energy impact damage on tension compression fatigue properties of sandwich panels was studied. Drop weight impact was applied to create internal laminate damage. An impact investigation preceded the fatigue tests to select an appropriate impact energy. An impact energy was chosen for the fatigue specimens which resulted in a barely visible damage. Constant amplitude fatigue tests were carried out at a stress ratio of R = -1 to determine the fatigue strength of impacted specimens. Damage propagation from the location of impact consisted of a combination of interlaminar delamination, fiber breakage and debonding of the laminate from the honeycomb. E.A.K.

**N83-23363#** Societe Nationale Industrielle Aerospatiale, Les Mureaux (France).
**COMPOSITE MATERIALS ON A COMMUTER AIRCRAFT: THE ATR. 42**
J. P. Petetin 1982 17 p Presented at the Tech. Symp. on the Design and Use of KEVLAR in Aircraft, Geneva, Oct. 1982
(SNIAS-822-111-105) Avail: NTIS HC A02/MF A01

Composite materials of carbon and KEVLAR aramid fiber designed by AEROSPATIALE for components used in the ATR.42 are presented.
Author

**N83-23364#** Fiber Materials, Inc., Biddeford, Maine. Advanced Materials Development Lab.
**IMPROVED GRAPHITE FIBER Final Technical Report, 1 Oct. 1979 - 31 Oct. 1982**
Roger Pepper and Elissa Brewster Oct. 1982 60 p refs
(Contract DAAK70-79-C-0209)
(AD-A123141; FM-91178-2) Avail: NTIS HC A04/MF A01 CSCL 11/4

The purpose of the program was to develop a production method for improved graphite fibers. A goal of 750 x 10 to the 3rd power psi tensile strength at 60-65 x 10 to the 6th power psi modulus was set for the program. Improved 3-4 micron diameter boron strengthened graphite fibers were successfully prepared from Courtaulds SAF polyacrylonitrile fiber precursor in a pilot production plant which has the potential capacity to produce 1 lb/hour of graphite fiber. An average tensile strength of 550 x 10 to the 3rd power psi at the 60 x 10 to the 6th power psi modulus level was achieved through a preliminary optimization of the plant processing conditions.
GRA

**N83-23365#** California Univ., Los Angeles. School of Engineering and Applied Science.
**NOTE ON SHEAR INTERACTION BETWEEN TWO FIBERS**
S. B. Batdorf Sep. 1982 12 p refs
(Contract N00014-76-C-0445)
(AD-A123144; UCLA-ENG-8116) Avail: NTIS HC A02/MF A01 CSCL 11/4

Application of shear lag theory to find the stress distribution in damaged composites has been handicapped by lack of knowledge concerning the effective shear stiffness of the matrix coupling adjacent fibers. This note gives an exact solution for a limiting case, namely two infinitely long rigid rods immersed in an infinite elastic matrix and displaced axially with respect to each other.
GRA

**N83-23366#** Dyna East Corp., Wynnewood, Pa.
**CUMULATIVE DAMAGE MODEL FOR ADVANCED COMPOSITE MATERIALS Final Report, Feb. 1981 - Apr. 1982**
Pei Chi Chou, A. S. D. Wang, and Harry Miller Wright-Patterson AFB, Ohio AFWAL Sep. 1982 241 p refs
(Contract F33615-80-C-5039; AF Proj. 2419)
(AD-A122859; AFWAL-TR-82-4083) Avail: NTIS HC A11/MF A01 CSCL 11/4

The objective of this research program is to develop a cumulative damage model for polymer-based, fiber reinforced composite laminates, To this end, four major damage modes are identified for concentrated study in this program. These include matrix-dominant transverse cracking and interlaminar delamination, fiber microbuckling under compressive stress, and fiber breaking and splitting under axial tension in the fiber direction. Generally, one or more of these damage modes are observed in the process of laminate failure. Analytical studies have been made in the past to describe the mechanics of each of these damage modes under conditions of static loads. The approach taken in this program is to adopt some of the existing mechanistically augmented damage models and extend them to describe the four types of damage modes under conditions of arbitrary cyclic loads.
GRA

**N83-23367#** Stanford Univ., Calif.
**MECHANICAL BEHAVIOR OF PARTICULATE COMPOSITES Final Report**
Oleg D. Sherby 1 Aug. 1982 27 p refs
(Contract N00014-75-C-0662)
(AD-A123047) Avail: NTIS HC A03/MF A01 CSCL 11/4

The program centers on a study of the mechanical properties of particulate metal-base composites. New processing techniques, principally through powder metallurgy processing, have been developed for attainment of ultrafine structures in particulate composites. Some of the discoveries made on the program are: materials with high 'threshold stresses' for creep; high specific modulus materials with isotropic properties; superplastic white cast irons, and enhanced densification of powders through phase transformation cycling.
GRA

**N83-23368#** California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
**STUDY OF PORE GROWTH IN GLASSY CARBON USING ANGLE X-RAY SCATTERING M.S. Thesis**
J. Hoyt Jul. 1982 34 p refs
(Contract DE-AC03-76SF-00098)
(DE83-0001360; LBL-14580) Avail: NTIS HC A03/MF A01

Small angle X-ray scattering was used to study the average pore size in glass like carbon as a function of both heat treatment time and heat treatment temperature. A pore growth model based on graphitization processes is presented. The simple mechanism shows that the change in the average radius of gyration with time is related to the total number of pores as a function of time, which in turn depends on the irreversible thermal expansion phenomenon.
DOE

**N83-23369#** Oak Ridge National Lab., Tenn.
**DEBONDING OF EPOXY FROM GLASS IN IRRADIATED LAMINATES**

C. E. Klabunde and R. R. Coltman, Jr. 18 Oct. 1982 15 p refs Presented at TMS/AIME Fall Meeting, St. Louis, 24 Oct. 1982
(Contract W-7405-eng-26)
(DE83-001898; CONF-821049) Avail: NTIS HC A02/MF A01

Glass-fabric-filled epoxies irradiated at 4.7 K and examined at room temperature by 20 x stereomicroscopy showed an internal flaw structure which increasingly filled the sample as the gamma dose was increased. These flaws were determined to be areas where the plastic debonded from the glass fibers. The extent of this process correlated well with the dose-dependent loss of mechanical strength. Evidence is reported for a similar mechanism in polyimides although visible flaws were produced. Possible mechanisms for debonding are suggested. New experiments are also suggested to clarify further the failure mechanism. Author (GRA)

# 25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*

**N83-23370** Royal Aircraft Establishment, Farnborough (England).
**CATAPHORETIC DEPOSITION OF DISPERSIONS OF PHENOL FORMALDEHYDE OLIGOMERS FROM CONCENTRATED ELECTROLYTE SOLUTIONS**
V. M. Polyakova, Yu. F. Deinega, L. N. Aleksandrova, L. A. Sirota, and A. I. Gavrilyuk Sep. 1982 11 p refs Transl. into ENGLISH from Ukr. Khim. Zh. (USSR), v. 48, no. 4, 1982 p 379-383
(RAE-Trans-2101; BR87702) Copyright. Avail: Issuing Activity CSCL 07D

The use of a surfactant to increase the metallic content of electrolyte depositions of phenol formaldehyde oligomers is described and a detailed analysis is given of the electrochemical interactions. Under suitable pH conditions stable suspensions can be maintained and cathodic coatings containing an average of 20 to 90% by weight of metal are obtained. Author

**N83-23371*#** National Aeronautics and Space Administration, Washington, D. C.
**MODELING AND TECHNICAL USE OF GAS EVOLVING ELECTRODES. PART 2: MODELING OF GAS-EVOLVING ELECTROLYZERS WITH FREE ELECTROLYTE CIRCULATION**
Martin Schleiff, Wolfgang Thiele (Buna Chemical Plant), and Herrmann Matschiner Mar. 1983 12 p refs Transl. into ENGLISH Chem. Tech. (Leipzig), v. 34, no. 5, 1982 p 250-252 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by Martin Luther-Univ., Halle-Wittenberg, East Germany
(Contract NASw-3541)
(NASA-TM-77045; NAS 1.15:77045) Avail: NTIS HC A02/MF A01 CSCL 07D

In an electrochemical reactor with gas-evolving electrodes, the transporting action of the gas bubbles can be used to move the electrolyte in a cycle flow, when the structure of the flow channels is suitable. For an electrolysis cell with such a circulation system a mathematic model was set up and evaluated. It is shown that in this manner, a rapid flow through the electrode gap can be achieved without additional energy consumption, in addition to a low gas fraction and a low cell voltage. The cell voltage and the attainable cycle spread are investigated as a function of the geometric parameters for their optimum values. Author

**N83-23372*#** National Aeronautics and Space Administration, Washington, D. C.
**ECONOMY OF PRECIPITATING AGENT APPLICATION IN MUNICIPAL WASTEWATER TREATMENT FACILITIES**
Uwe Neis, Bernhard Geppert, Hermann H. Hahn, and Dietrich Gleisberg (Hoechst Ltd.) Mar. 1983 23 p refs Transl. into ENGLISH from GWF-Wasser/Abwasser (West Germany), v. 122, no. 6, 1981 p 242-250 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by Karlsruhe Univ., West Germany
(Contract NASw-3541)
(NASA-TM-77059; NAS 1.15:77059) Avail: NTIS HC A02/MF A01 CSCL 07D

Purification by precipitation in this study is not considered primarily as a means of phosphate removal but as a method for reduction of suspended solids BOD and COD. A dynamic calculation procedure is used to allow for exact determination of time dependent variation of costs. The results show that costs of wastewater treatment by precipitation may equal those of conventional primary clarification and secondary biological treatment, especially with low-cost iron-II-salts in simultaneous precipitation and in larger plants (< 20,000 PF). Cost advantages may be accrued in smaller plants by using the more expensive trivalent salts in pre-precipitation as compared to conventional low-load biological treatment. This is due mainly to better effluent quality and, consequently, lower wastewater fees (Wastewater Discharge Act). If the precipitant is dosed temporarily only during periods of highest pollution the savings can be about 5 to 10%. Author

**N83-23373#** Rockwell International Corp., Canoga Park, Calif. Energy Systems Group.
**FLASH HYDROLIQUEFACTION OF COAL Quarterly Technical Progress Report, 4 Apr. - 3 Jul. 1981**
24 May 1982 120 p refs
(Contract DE-AC22-80PC-30018)
(DE82-021594; DOE/PC-30018/3; ESG-DOE-13377QTPR-3) Avail: NTIS HC A06/MF A01

A reactor which allows rapid and uniform mixing of pulverized coal with heated hydrogen through the use of a rocket engine type injector was developed. The hydrogen is partially heated by indirect heating and further heated by partial combustion with oxygen to supply the required process heat. The amount of hydrogen fed is being kept as low as practicable because of the recycle implication for a complete process. Successful operation of a water cooled heat exchange quench unit without plugging or degradation was demonstrated. Char is separated from the vapor phase material in a separator which is maintained at a sufficiently high temperature to allow vapor phase removal of the liquid products. The effectiveness of the concept was demonstrated in a series of tests. Substantial liquid yields and high overall conversions are possible. A high pressure product recovery system contains two condensers which split the liquid product into heavy and light oil fractions. DOE

**N83-23374#** Battelle Inst., Frankfurt am Main (West Germany). Fachbereich Produkt- und Verfahrensentwicklung.
**RESEARCH AND DEVELOPMENT WORK CONCERNING THE SEPARATION OF HELIUM FROM GAS MIXTURES BY SiO2 COMPOSITE MEMBRANES Final Report, Oct. 1981**
Wolfram Kreiger and Peter Wiessart Bonn Bundesministerium fuer Forschung und Technologie Dec. 1982 47 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-211; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Ger. DM 10

Methods for the selective separation of helium from natural gas as an alternative to natural gas liquefaction was investigated. Composite membranes were examined for their usefulness for the separation of helium from a methane helium mixture. These composite membranes consisted of a polyimide film to which a thin silicon dioxide film was applied. A test apparatus was used for permeation measurements with helium, methane and a mixture of helium and methane at different temperatures and pressures. The permeation coefficients of helium and methane were determined, and the composition of the permeate was identified. It is found that helium is present in the permeate in a high concentration. E.A.K.

**N83-23375#** Preussag A.G. Metall, Goslar (West Germany).
**PROCESS DEVELOPMENT FOR THE RECYCLING OF WASTE AND BY-PRODUCTS CONTAINING CADMIUM Final Report, Apr. 1981**
Kunibert Hanusch Bonn Bundesministerium fuer Forschung und Technologie Dec. 1982 37 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-217; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 8

The development of a process for the treatment of pigment waste containing Cd and Se was investigated. The following multistage recoveries are applied: (1) oxidizing leaching of the pigment wastes in sulphuric acid, in the presence of Fe3+ ions; (2) precipitation of cadmium by cementation with zinc dust; (3) roasting of the residues from the leaching stage, enriched in Se; (4) leaching of the roasted product and precipitation of selenium. It is found that more than 90% of he Cd input could be brought into solution. A model computation with a view to integrating the pigment leaching into the Cd recovery process of a Preussag smelter is conducted. E.A.K.

**N83-23376#** Goetzelmann K.G., Stuttgart (West Germany).
**DEVELOPMENT OF A PROCESS FOR ELECTROLYTIC RECOVERY OF METALS FROM DILUTED WASTE WATER Final Report, Aug. 1980**
Hans-Wilhelm Lieber Bonn Bundesministerium fuer Forschung und Technologie Dec. 1982 57 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-224; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, DM 12

The electrolytic recovery of metals from waste water instead of producing metal containing sludges to be dumped was examined. Many electrolytic processes are developed for electrolytic recovery of nobel metals from diluted solutions. Conditions for deposition of electronegative metals from waste water, however, are different from processes like electroplating or electrolytic metal refining. It is shown that metal deposition down to very small concentrations within the ppm range can be obtained with lower electrolytic currents by a forced flow of waste water through a rotating particulate bed cathode whereas for higher currents impact rod cathodes have proven more successfully. Residual metal ions can be completely removed from waste water by ion exchange resins. This new process is tested using waste water which mainly contains nickel, cadmium and zinc. E.A.K.

**N83-23377#** Bergbau-Forschung G.m.b.H., Essen (West Germany). Abt. Physikalische Chemie.
**CARBONACEOUS TUBULAR MEMBRANES FOR ULTRAFILTRATIONS Final Report, Apr. 1982**
Klaus Wybrands Bonn Bundesministerium fuer Forschung und Technologie Dec. 1982 124 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-229; ISSN-0340-7608) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 26

The application of commercial membranes for separation processes which is restrained by lacking chemical stability in aggressive fluids and at extreme temperatures is discussed. The application range of carbonaceous membranes would be considerably wider. Suitability tests on carbonaceous tubular membranes for ultrafiltration of organic compounds from aqueous solutions were run. The pore structure of the membranes was determined by mercury porosimetry and permeation measurements with gases and water. It is found that by process control either structurally stable membranes or membrane structures changing under pressure can be obtained. Aqueous solutions of varying composition, temperature, pressure and Reynolds number were used for determination of separation properties. E.A.K.

**N83-23378#** Karlsruhe Univ. (West Germany). DVGW-Forschungsstelle am Engler-Bunte Inst.
**INVESTIGATIONS ON THE REMOVAL OF HYDROGEN FLUORIDE AND HYDROGEN CHLORIDE DURING THE TREATMENT OF COAL GASIFICATION GASES Final Report, Jun. 1981**
Boloor Ramananda Rao, Hellmut Lischer, Helga Katzer, and Kurt Hedden Bonn Bundesministerium fuer Forschung und Technologie Dec. 1982 64 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-238; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 13,50

Impurities in coal such as fluorine and chlorine which are released as hydrogen compounds during gasification were investigated. The impurities have to be removed, at least partially, to prevent air pollution by combustion of such gases. Different analytical methods for hydrogen fluoride and hydrogen chloride were tested for their suitability of coal gasification gases and modified, due to disturbing accompanying components. The removal of hydrogen halides and ammonia by absorption with different solutions (water, ammonium chloride, calcium hydroxide and calcium hydroxide/calcium chloride solutions) was investigated in a bubble tray column. The complete removal of hydrogen chloride was achieved with all the solutions. It is found that the absorption efficiencies decreases during the simultaneous absorption of hydrogen chloride and ammonia E.A.K.

**N83-23379#** Air Force Academy, Colo.
**ELECTROCHEMICAL SURVEY OF SELECTED CATIONS AND ELECTRODE MATERIALS IN DIALKYLIMIDAZOLIUM CHLOROALUMINATE MELTS Interim Report, Sep. 1981 - Feb. 1982**
Bernard J. Piersma and John S. Wilkes Sep. 1982 139 p refs (AF Proj. 2303)
(AD-A122840; FJSRL-TR-82-0004) Avail: NTIS HC A07/MF A01 CSCL 07/4

Room temperature chloroaluminate melts of 7 dialkylimidazolium chlorides were prepared and studied using cyclic voltammetry in basic (excess organic) and acidic (excess AlCl3) regions. 1-methyl-3-ethyl imidazolium chloride was selected for further electrochemical studies. Twenty-one electrode materials were studied for stability in the melts. Initial studies were performed to identify and characterize the redox and metal deposition behaviors of 25 cations (primarily chloride salts of transition metal ions). Author (GRA)

**N83-23380#** Delaware Univ., Newark. Coll. of Marine Studies.
**DEVELOPMENT OF PHOTOACOUSTIC SPECTROSCOPY FOR THE STUDY OF BIOFILM FORMATION UNDER WATER Final Report**
Stephen C. Dexter Sep. 1982 45 p refs
(Contract N00014-77-C-0064; NR Proj. 104-979)
(AD-A122877) Avail: NTIS HC A03/MF A01 CSCL 07/4

A growing body of literature from a number of diverse scientific disciplines has documented that adsorption of a nonliving molecular organic conditioning film is the first event in the modification of a solid surface upon its immersion in any natural aqueous environment. The conditioning film has been described by a number of researchers using a variety of techniques. Baier (1972) and Baier and Weiss (1975) have used Multiple Attenuated Internal Reflection (MAIR) IR Spectroscopy and contact angle measurements to show how the solid surface energy is modified by adsorption of organics in human blood and in seawater. Neihof and Loeb (1974) and Loeb and Neihof (1975) have followed formation of the film in seawater by ellipsometry and by microelectrophoresis. Baier (1972) and Tosteson et al. (1978) have discussed the composition of the film and have shown it to consist of an initially adsorbed glycoprotein coating and a subsequent layer of mucopolysaccharide rich adhesive substances. Author (GRA)

**N83-23381#** Pennsylvania Univ., Philadelphia. Dept. of Materials Science.
**GORDON RESEARCH CONFERENCE ON HIGH TEMPERATURE CHEMISTRY Final Report**

Wayne L. Worrell and Karl E. Spear (Pennsylvania State Univ.) Aug. 1982 17 p Conf. held in Tilton, N. H., 26-30 Jul. 1982 Sponsored in part by the Office of Naval Research
(AD-A123053) Avail: NTIS HC A02/MF A01 CSCL 07/4

The 1982 Conferences had 17 invited talks in the areas of: Kinetics of Gas Phase Reactions; Surface Reactions; Chemical vapor Transport; Novel Investigations of Corrosion Reactions; Thermodynamics of Liquids and Glasses; Solid State Electrochemistry; Nuclear Reactor Accident Modeling and High Temperature Chemistry; Ab Initio Calculations of Molecular Structure and Properties, and Spectroscopy of High Temperature Molecules.
GRA

**N83-23382#** EIC, Inc., Newton, Mass.
**STUDIES OF THE LITHIUM ELECTRODE IN OXYCHLORIDE SOLVENTS Final Report, 1 May 1979 - 30 Apr. 1982**
G. L. Holleck, K. D. Brady, M. Yaniv, and K. M. Abraham Dec. 1982 62 p refs
(Contract DAAG29-79-C-0045)
(AD-A123054; C-548; ARO-16116.2-CH) Avail: NTIS HC A04/MF A01 CSCL 07/4

In this study we investigated the formation of protective surface films on in situ freshly exposed Li in LiAlCl4/SOCl2 electrolytes using electro-chemical techniques. Based on the results we propose a film model consisting of three regions. Region 1 forms rapidly (less than one hour) upon exposure of a fresh surface. It has a thickness between 200 and 400 A and an apparent resistivity of -2.10 7 cm. It appears to have significant imperfection and some microporosity along the grain boundaries. This is followed by a Region 2 film which is more ordered and more compact. Its resistivity is approximately 2.l0 to the 8th power cm and it grows to 200 to 600 A within a 20 hour period. Further growth is slow.
Author (GRA)

**N83-23383#** Midwest Research Inst., Golden, Colo. Thermochemical and Electrochemical Research Branch.
**SURVEY OF THE ELECTROCHEMISTRY OF SOME BIOMASS-DERIVED COMPOUNDS**
Helena L. Chum and Robert A. Osteryoung (State Univ. of New York) Dec. 1982 65 p refs
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE83-004725; SERI/TR-332-417) Avail: NTIS HC A04/MF A01

A literature survey of the electrochemistry of selected biomass-derived compounds is presented. Chemials successfully synthesized electroorganically from mono- and polysaccharides include dialdehyde starch, aldonic acids, and polyalcohols. In general, such synthesis aim at speciality chemicals. Fuel cells employing poly- and monosaccharides generate low power densities. Recommendations for future research are made which encourage the electrochemical research of polymeric materials resulting from newly developed pretreatments of biomass, such as explosive decompression and organosolv pretreatments of wood. Because lignins are the only renewable source of phenolic compounds, electrochemical research of these materials is strongly encouraged. DOE

**N83-23384#** Delaware Univ., Newark. Center for Catalytic Science and Technology.
**KINETICS AND MECHANISM OF CATALYTIC HYDROPROCESSING OF COMPONENTS OF COAL-DERIVED LIQUIDS Quarterly Report, 16 Aug. 1981 - 15 Feb. 1982**
Bruce C. Gates, James R. Katzer, Harold Kwart, Jon H. Olson, G. C. A. Schuit, Alvin B. Stiles, and Leon Petrakis (Gulf Research and Development Co.) 26 Mar. 1982 31 p refs
(Contract DE-AC22-79ET-14880)
(DE82-019764; DOE/ET-14880/09; QR-10; QR-11) Avail: NTIS HC A03/MF A01

Heavy distillate derived from SRC-II coal liquid was separated into nine well-characterized fractions by preparative liquid chromatography. The neutral oils fraction is the most important fraction because it is the largest (73.5 wt % of the total) and the easiest to upgrade by hydroprocessing. Most of the sulfur in the heavy distillate is concentrated in this fraction. The hydroprocessing of this fraction was studied in a high-pressure plug flow microreactor and a standard batch autoclave reactor using a standard commercial catalyst. Pseudo first-order rate constants were determined for the hydrodesulfurization of three sulfur-containing compounds. The effect of pressure was investigated in the range 120 to 150 atm. An experiment was done using the neutral oils fraction spiked with 4-methyldibenzothiophene. The results show that there is little hydrogenation even when hydrodesulfurization is almost complete.
DOE

**N83-23385#** West Virginia Univ., Morgantown. Dept. of Chemical Engineering.
**ROLE OF C-CO SUB 2 IN GASIFICATION OF COAL AND CHAR Final Report, 15 Aug. 1978 - 15 Nov. 1981**
J. T. Sears and C. Y. Wen 1981 124 p refs
(Contracts DE-AC21-78ET-11338; ET-78-S-01-3253)
(DE82-016392; DOE/ET-11338/1216) Avail: NTIS HC A06/MF A01

The objectives were to investigate coal-char gasification reactions with CO2, H2O and other gases, to examine fluid dynamics of char present in a fluidized bed, and to develop a computer model of the fluid-bed gasification which can incorporate such information. To these ends a unique high pressure/temperature thermogravimetric analysis instrument, a pressurized 30 cm-dia. fluid bed, and a high-temperature 13 cm fluid bed were constructed. Coal pyrolysis and char reactions were examined at temperatures to 1600 C and pressure to 28 atm. Extent of pyrolysis was shown to depend on particle size and pressure, and in three stages on temperatures. Char properties were determined, including diffusion coefficients of CO2 in char and surface areas. Char reactivity does not strongly depend on pressure in the range 1 to 28 atm. Diffusion limits are strongly present above 1000 C. Fluid bed gasification can be modeled successfully, and a basic model is presented.
DOE

**N83-23386#** State Univ. of New York, Binghamton. Dept. of Chemistry.
**DESULFURIZATION WITH TRANSITION-METAL CATALYSIS Quarterly Progress Report, 27 Mar. - 27 Jun. 1982**
John J. Eisch Jul. 1982 5 p
(Contract DE-FG22-81PC-40782)
(DE82-019079; DOE/PC-40782/T2) Avail: NTIS HC A02/MF A01

The principal objective was to uncover new reagents and catalysts for upgrading coal-derived fuels by removing undesirable organosulfur, organonitrogen and, if feasible, organooxygen components. The following studies were initiated or continued: a study of the desulfurizing action of nickel, cobalt and copper salts, combined with metal hydrides, on SRC plant liquids survey of the capability of low-valent nickel reagents to desulfurize, in one step, sulfones and other model organosulfur compounds; development of molybdenum-based desulfurizing agents; and exploration for denitrogenating agents suitable for quinolines and carbazoles. The following progress was made: nickel salts are superior to cobalt and copper salts in desulfurizing SRC liquids; in a two-step treatment, an SRC liquid was freed of 90% of its sulfur (0.5 to 0.05%); in ethereal solutions, vinylic and acetylenic sulfones can be reduced to sulfides by metal hydrides; inclusion of nickel salts gives some desulfurization; some butadiene-molybdenum complexes were synthesized.
DOE

**N83-23387#** Department of Energy, Pittsburgh, Pa.
**SULFUR REDUCTION POTENTIAL OF THE BITUMINOUS COALS OF PENNSYLVANIA**
J. T. Wizzard, J. A. Cavallaro, and A. W. Deurbrouck Aug. 1982 333 p
(DE82-022070; DOE/PETC/TR-82/15) Avail: NTIS HC A15/MF A01

The results of a washability study of 205 raw coal channel samples with an emphasis on sulfur reduction are reported. These raw coals contained on the average 14.8% ash, 1.73% pyritic sulfur, 2.52% total sulfur, 12,812 Btu/lb, and 4.0 pounds of SO2 emissions per million Btu, on a moisture free basis. The complete washability data and ultimate-proximate data are presented for

these samples. Statistical evaluations of the washability data and ultimate-proximate analyses are presented on a coalbed basis, whenever there are six or more samples from a given coalbed. An additional evaluation is included showing the composite data interpolated at Btu recovery levels of 50, 60, 70, 80, 90, and 100%. Graphical representations are given for various coal characteristics of both raw and washed coal fractions for all coalbeds, with six or more samples. DOE

**N83-23388#** California Univ., Berkeley. Lawrence Berkeley Lab. Dept. of Chemical Engineering.
**OXYDESULFURIZATION OF COAL Ph.D. Thesis**
Gregg A. Cremer, David A. Mixon, Sabri Ergun, and Theodore Vermeulen May 1982 94 p refs
(Contract DE-AC03-76SF-00098)
(DE82-020980; LBL-14491) Avail: NTIS HC A05/MF A01

Pyrite, a principal sulfur-bearing component of high sulfur coals, reacts with oxygen to form ferric sulfate and sulfuric acid. By using these products as the reaction medium, the use of water is minimized, and the products are recoverable in essentially pure form. The reaction kinetics for oxidation of native pyrite and oxidation of pyrite in coal are compared in the range of 100 to 150 C, and it is concluded that acid iron sulfate media provide an effective means for inorganic sulfur removal. On the other hand, removal of organic sulfur is difficult to achieve without significantly lowering the heating value of the coal. Therefore the economic use of acidic oxidation is likely to be limited to coals in which pyrite comprises a large part of the total sulfur content. DOE

**N83-23389#** Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Civil Engineering.
**EXPERIMENTAL INVESTIGATION AND PREDICTIVE MODELING OF THE ADSORPTION OF POLYCYCLIC AROMATIC HYDROCARBONS FROM WATER ONTO ACTIVATED CARBON Annual Report, 1 Sep. 1980 - 31 Oct. 1981**
R. W. Walters and R. G. Luthy Jul. 1982 208 p refs
(Contract DE-FG22-80PC-30246)
(DE82-020723; DOE/PC-30246/1237; AR-1) Avail: NTIS HC A10/MF A01

Eleven of the sixteen polycyclic aromatic hydrocarbons (PAH) which appear on the US Environmental Protection Agency priority pollutant list were investigated with respect to adsorption onto activated carbon. Adsorption characteristics were examined in terms of PAH molecular and physiochemical properties. The partitioning behavior of PAH was investigated by generating adsorption isotherm data for eleven PAH from water onto Filtrasorb 400 activated carbon at 25 C using batch shake testing. An evaluation of the Henry's Law, Langmuir, BET, Freundlich and Redlich-Peterson adsorption isotherm equations indicated that the Langmuir equation most appropriately represents the data. Correlations which are presented here provide an understanding of the behavior of PAH in industrial process and treated wastewaters, and will assist the engineer or scientists in assessing the design of treatment systems for PAH removal. DOE

**N83-23390#** Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
**PRELIMINARY ASSESSMENT OF CONDENSATION BEHAVIOR FOR HYDROCARBON-VAPOR EXPANSIONS WHICH CROSS THE SATURATION LINE NEAR THE CRITICAL POINT**
O. J. Demuth Jul. 1982 33 p refs
(Contract DE-AC07-76ID-01570)
(DE82-018095; EGG-GTH-5960) Avail: NTIS HC A03/MF A01

Analyses of binary cycles for conversion of geothermal energy from moderate temperature resources to electrical energy have shown potential gains in net geofluid effectiveness of on the order of 8%, resulting from selection of turbine expansion processes whose equilibrium states pass through the two phase region (assuming major condensation does not occur). If condensation occurs, this gain could be reduced or eliminated by the resulting loss in turbine efficiency. Experience with many fluids, however, indicates that vapor supersaturation (or subcooling) permits metastable pure vapor states to exist at temperatures considerably below the saturation temperature at a given pressure; thus, by better understanding the condensation process, and properly structuring the cycle, substantial performance gains may be achievable. The probability for attaining this performance gain is assessed. DOE

**N83-23391#** Brookhaven National Lab., Upton, N. Y.
**CASCADES FOR HYDROGEN ISOTOPE SEPARATION USING METAL HYDRIDES**
F. B. Hill and V. Grzetic 1982 13 p refs
(Contract DE-AC02-76CH-00016)
(DE82-013197; BNL-31042) Avail: NTIS HC A02/MF A01

Designs are presented for continuous countercurrent hydrogen isotope separation cascades based on the use of metal hydrides. The cascades are made up of pressure swing adsorption (PSA) or temperature swing adsorption (TSA) stages. The designs were evolved from consideration of studies of the separation performance of four types of PSA and TSA processes. DOE

**N83-23392#** Brookhaven National Lab., Upton, N. Y. Materials Chemistry and Energy Conversion Div.
**CURRENT RESEARCH IN ADVANCED WATER ELECTROLYZER IN THE UNITED STATES AND ABROAD**
M. Bonner, T. Botts, J. McBreen, A. Mezzina, F. Salzano, and C. Yang Jul. 1982 6 p refs Presented at the 17th Intersoc. Energy Conversion Eng. Conf., Los Angeles, 8-12 Aug. 1982
(Contract DE-AC02-76CH-00016)
(DE82-021744; BNL-31666; CONF-820814-29) Avail: NTIS HC A02/MF A01

An overview on advanced water electrolysis systems for H2 production is provided. The survey of the work sponsored by the Department of Energy through Brookhaven National Laboratory (BNL) includes: General Electric's scale-up of SPE technology; Teledyne's identification of the best available electrodes and separators for advanced alkaline systems; Life Systems' testing of a novel static water feed concept; and advanced electrolysis research at BNL. Also included is recent progress in Canada, Europe (development of inorganic ion exchange membranes), and Japan (alkaline and SPE plants) which is based on information reported to the International Energy Agency. DOE

**N83-23393#** Mound Lab., Miamisburg, Ohio.
**DEVELOPMENT OF COMBINED ELECTROLYSIS CATALYTIC EXCHANGE Final Report**
Robert E. Ellis, James E. Lentz, Michael L. Rogers, and Charles J. Sienkiewicz 24 Jun. 1982 29 p refs
(Contract DE-AC04-76DP-00053)
(DE82-018628; MLM-2952) Avail: NTIS HC A03/MF A01

Aqueous wastes contaminated with tritium in the form of HTO pose a difficult disposal problem. Since the only difference between HTO and the major constituent (H2O) of such wastes is the isotopic form of the hydrogen, an isotopic separation process is required for decontamination of these wastes. Several processes were tried experimentally before the Combined Electrolysis Catalytic Exchange (CECE) process was chosen for pilot-scale development. This process concentrates tritium in the water phase by contacting gaseous hydrogen with water over a catalyst. Experimental work was performed to determine the effects of tritium radiolysis on the electrolysis cells and exchange catalyst. Processes to remove impurities from the feed stream were developed, and in order to evaluate feasibility, a small, pilot-scale CECE system was designed, built, and operated. Several potential applications are discussed, and results of experimental work for two of these applications are given. DOE

**N83-23394#** Ohio State Univ., Columbus. Dept. of Chemistry.
**ANALYTICAL AND PHYSICOCHEMICAL STUDIES OF NON-ELECTROLYTE SOLUTIONS**
C. J. Chien Aug. 1982 271 p refs
(DE82-020759; DOE/ER-10554/22) Avail: NTIS HC A12/MF A01

High precision gas liquid chromatographic studies of N,N dibutyl-2-ethylhexylamide (DBEHA), n-hexadecyl iodide, and

4-n-pentyl-4'-cyanobiphenyl (PCB) were carried out on the neat form and dissolved in n-hexadecane, n-octadecane, and tetra-n-butyltin. The microscopic partition hypothesis did not describe the behavior of these solvent mixtures. Conventional solutions theories failed to describe the experimental data derived. Complexation studies of N,N-dialkylamides (N,N-dimethyl formamide, N,N-dimethyl acetamide, and N,N-dimethyl thioformamide) by NMR showed that mixtures of these species with C6H6 or CCl4 could not be described by simple equations. The window diagram strategy was successful for several solvents with packed columns of mixed bed stationary phases. For intimate mixtures of phases highly ordered liquid crystals gave relative retentions for inert solutes different from highly polarizable solutes. DOE

**N83-23395#** Louisiana State Univ., Baton Rouge. Dept. of Chemistry.
**LUMINESCENCE STUDIES: LUMINESCENCE OF AQUEOUS IONIC SOLUTIONS; TEMPERATURE DEPENDENCE OF THE PHOSPHORESCENCE OF PHENANTHRENE IN ETHANOL. EFFECTS OF GASES Ph.D. Thesis**
Terrence Lenoir Mathers May 1982 171 p refs
(Contract DE-AS05-76EV-03018)
(DE82-020347; DOE/EV-03018/T6) Avail: NTIS HC A08/MF A01

The anomolous luminescence of aqueous solutions of I(-), Br(-), OH(-), etc. is characteristic of the solvent. The emission of a KBr solution is greatly reduced by purification of the KBr; however, this emission reappears upon addition of acids. This luminescence is postulated to be due to the recombination of H3O(+) and e(-). Hydroxide and hydrosulfide may be from transferring a hydrogen atom to the water. The hydronium radical and the triplet state of water are discussed. Neither can account for the luminescence; however, an excited state complex between water and a H atom may be involved. Effects of gases on the temperature dependences of the phosphorescence of phenanthrene in ethanol are studied. Both the glass transition region and crystal formation region for ethanol are shifted when O2 or N2 is added. Other nonpolar gases (Ar and ethane) do not exhibit this shift. The effect for O2 and N2 is explained by invoking hydrogen bond breaking, which also affects the denaturation of DNA. DOE

**N83-23396#** Ohio State Univ., Columbus. Dept. of Chemistry.
**DEVELOPMENT AND OPTIMIZATION OF METHODOLOGIES FOR ANALYSIS OF COMPLEX HYDROCARBON MIXTURES Final Technical Report, 1 Jan. 1980 - 31 Aug. 1982**
Richard J. Laub Aug. 1982 28 p refs
(Contract DE-AC02-80ER-10554)
(DE82-021581; DOE/ER-10554/28) Avail: NTIS HC A03/MF A01

The research encompassed rotating-disk thin-layer chromatography, column liquid chromatography, and gas chromatography of hydrocarbon and related samples of interest to the Department of Energy. Because of the very large number of topics investigated, only the major results from each of the above research areas are presented in this report. DOE

**N83-23397#** Ohio State Univ., Columbus. Dept. of Chemistry.
**DEVELOPMENT AND OPTIMIZATION OF METHODOLOGIES FOR ANALYSIS OF COMPLEX HYDROCARBON MIXTURES Technical Progress Report, 1 Sep. 1981 - 31 Aug. 1982**
Richard J. Laub Aug. 1982 64 p refs
(Contract DE-AC02-80ER-10554)
(DE82-020764; DOE/ER-10554/27) Avail: NTIS HC A04/MF A01

During the past year, several technical reports have appeared in the open literature from this Laboratory, and these and a number of others are included as supplemental reports to this document. All of these pertain to the optimization of gas- and liquid-chromatographic separations of complex mixtures of organic compounds of significance to the Department of Energy. Because of the very large amount of experimental information obtained during this period, only the highlights of selected research results are presented. DOE

**N83-23398#** Ohio State Univ., Columbus. Dept. of Chemistry.
**EFFECTS OF TEMPERATURE AND MOBILE-PHASE COMPOSITION ON RETENTIONS IN COLUMN LIQUID CHROMATOGRAPHY M.S. Thesis**
Annjia Hsu Aug. 1982 156 p refs
(Contract DE-AC02-80ER-10554)
(DE82-020756; DOE/ER-10554/21) Avail: NTIS HC A08/MF A01

Binary-additive mobile phase systems were investigated for a more exact control over chromatography. If the mobile phase was nonpolar binary solvents (e.g., n-hexane and dichloromethane), trace amounts of THF and/or ACN could be added to control solute retentions as a function of solvent composition. Temperature also plays an important role in the coverage of modifier molecules on the surface of the adsorbent. Higher efficiencies were obtained at lower temperatures. For chromatographic systems having large extra-column volumes, higher column temperature will also reduce column efficiency. Solvophobic effects and polar-group selectivity control the chromatographic behavior of phenols in reversed-phase liquid chromatography (RPLC). The former effect predominates with the THF system, and the latter with the MeOH system. Substituent groups decrease the hydrophobic effect of phenols in aqueous media. However, owing to steric effects, ortho-substituted phenols usually eluted water. DOE

**N83-23399#** Bendix Corp., Kansas City, Mo.
**DETERMINATION OF SILANOL IN SILICONES BY QUANTITATIVE FTIR**
G. W. Griffith Aug. 1982 25 p Presented at the Soc. for Appl. Spectry. and Rocky Mt. Chromatog. Group Conf., Denver, 1-5 Aug. 1982
(Contract DE-AC04-76DP-00613)
(DE82-020342; BDX-613-2825; CONF-820850-1) Avail: NTIS HC A02/MF A01

A great many two component silicone resins depend upon the reaction of a silane hydrogen containing (SiH) material with a silanol containing (SiOH) material. Nearly every available method for silanol analysis was tried in an effort to find a reliable one. As a result, an infrared method was developed that is not only fast and reliable but has very few interferences. The method involves measuring the absorbance of the nonbonded SiOH band (3685 cm-1) of very dilute solutions of the silanol in carbon tetrachloride. The analysis is performed on an FTIR spectrophotometer, and the effects of moisture and other interfering species are digitally subtracted. The choice of a suitable standard silanol proved to be one of the most difficult problems to overcome, since the absorptivity coefficient is somewhat structure dependent. DOE

**N83-23400#** SRI International Corp., Menlo Park, Calif. Materials Research Lab.
**MECHANISM OF CATALYTIC GASIFICATION OF COAL CHAR Quarterly Technical Progress Report, 1 Apr. - 30 Jun. 1982**
B. J. Wood, B. L. Chan, R. H. Fleming, R. D. Brittain, K. M. Sancier, D. R. Sheridan, and H. Wise 21 Sep. 1982 38 p refs
(Contract DE-AC21-80MC-14593)
(DE83-000416; DOE/MC-14593/T6; QTPR-7) Avail: NTIS HC A03/MF A01

A char gasification mechanism in which the catalyst reacts chemically with the carbon and also with the oxidizing gas to transfer reactive oxygen from the gaseous reactant to the char is discussed. The oxygenated carbon structure splits to yield CO, a major gasification product. Efforts aimed at elucidating some mechanistic details of this scheme are discussed. Since transfer of electric charge between catalyst and char is a feature of the mechanism, the thermoelectric power of catalyst-impregnated carbon wafers were measured to identify the charge carrier type. The results show that, at steady state in an inert atmosphere, electron holes, probably in the carbon phase, are the majority charge carriers. However, during the initial interaction between the catalyst and the carbon, a transient condition exists in which the nature of the electrical transport process is not clear. The

chemical mechanism of catalytic gasification of coal char is not yet understood. DOE

**N83-23401#** Institute of Gas Technology, Chicago, Ill.
**IMPROVED PHOTOANODES FOR PHOTOELECTROLYSIS**
Paul F. Richardson, Peter G. P. Ang, and Anthony F. Sammells 1982 16 p refs Presented at the World Hydrogen Energy Conf., Pasadena, Calif., 13-17 Jun. 1982
(DE83-900078; CONF-820605-22) Avail: NTIS HC A02/MF A01

Photocurrents of the oxide semiconductors n-type titanium dioxide and n-type iron oxide in aqueous electrolyte have been improved by deposition of an oxygen evolution catalyst (platinum, rhodium) onto the semiconductor. In addition, the photocurrents of titanium dioxide were also improved by optimization of the carrier density of the electrode upon passing sequences of anodic and cathodic currents. A negative shift in flat band potential of titanium dioxide in the presence of dextrose in the electrolyte solution was demonstrated. DOE

**N83-23402#** Los Alamos Scientific Lab., N. Mex.
**HYBRID CHEMICAL AND NONDESTRUCTIVE-ANALYSIS TECHNIQUE**
S. T. Hsue, S. F. Marsh, and T. Marks 1982 11 p refs Presented at Intern. Symp. on Recent Advances in Nucl. Materials Safeguards, Nienna, Australia, 8 Nov. 1982
(Contract W-7405-eng-36)
(DE83-000613; LA-UR-82-2754; CONF-821119-1) Avail: NTIS HC A02/MF A01

A hybrid chemical/NDA technique has been applied at the Los Alamos National Laboratory to the assay of plutonium in ion-exchange effluents. Typical effluent solutions contain low concentrations of plutonium and high concentrations of americium. A simple trioctylphosphine oxide (TOPO) separation can remove 99.9% of the americium. The organic phase that contains the separated plutonium can be accurately assayed by monitoring the uranium L X-ray intensities. DOE

**N83-23403#** Illinois Univ., Urbana. Dept. of Physics.
**PHOTOEMISSION SPECTROSCOPY OF SURFACES AND ADSORBATES**
T.-C. Chiang, G. Kaindl (Freis Univ., Berlin, West Germany), F. J. Himpsel (IBM, Yorktown Heights, N.Y.), and D. E. Eastman 1982 13 p refs Presented at the Intern. Conf. on X-ray and Atomic Innershell Plys., Eugene, Oreg., 23 Aug. 1982
(Contracts DE-AC02-76ER-01198; F49620-81-C-0089)
(DE81-021591; DOE/ER-01198/1388; CONF-820855-2) Avail: NTIS HC A02/MF A01

Core level photoelectron spectroscopy is providing information concerning the electronic properties of adsorbates and surfaces. Several examples are discussed, including studies of adsorbed rare gas submonolayers and multilayers as well as clean metal surfaces. For rare gas multilayers adsorbed on metal surfaces, the photoelectrons and Auger electrons exhibit well resolved increases in kinetic energy with decreasing distance between the excited atom and the substrate, allowing a direct labeling of the layers. These energy shifts are mainly due to the substrate screening effects, and can be described well by an image charge model. For a Kr/Xe bilayer system prepared by first coating a Pd substrate with a monolayer of Kr and then overcoating with a layer of Xe, a thermally activated layer inversion process is observed when the temperature is raised, with Xe coming in direct contact with the substrate. DOE

**N83-23404#** Oak Ridge Gaseous Diffusion Plant, Tenn. Analytical Chemistry Dept.
**QUANTITATIVE INFRARED SPECTROPHOTOMETRY: EMPIRICAL EXTRAPOLATION FROM CALIBRATION CONDITIONS**
W. D. Hedge and C. M. Turner Aug. 1982 25 p refs
(Contract W-7405-eng-26)
(DE83-000052; K/TL/AT-142) Avail: NTIS HC A02/MF A01

Quantitative infrared spectrophotometry measurements of infrared active compounds in the gaseous phase which depend upon many variables, some of which are dependent on instrument capabilities, environmental conditions, and sample definition is discussed. In quantitative measurements, calibration of an instrument in a set environment provides the necessary constants to determine the concentration of a particular compound in a sample gas. The constants may change, however; if the conditions of measurement vary. The estimation of infrared constants when the following conditions change from calibration conditions using a particular infrared spectrophotometer (25-mm AgCl windows) were studied: pathlength, sample temperature, absorptivity level, and scanning speed. The intent of the study is to make users of process control infrared spectrophotometers aware. It is shown how varying conditions affect results obtained from such instruments. DOE

**N83-23405#** Los Alamos Scientific Lab., N. Mex.
**PHOTOCHEMISTRY: PAST AND PRESENT**
F. B. Wampler 1982 8 p refs Presented at the 1st Intern. Congr. on Appl. of Laser and Electro-Optics, Boston, 21-23 Sep. 1982 Submitted for publication
(Contract W-7405-eng-36)
(DE82-021892; LA-UR-82-2430; CONF-820949-1) Avail: NTIS HC A02/MF A10

Photochemistry is influenced greatly by the application of lasers as excitation sources. Comparisons are made to illustrate this impact. It is shown how lasers revolutionized this research field. Reaction kinetics, isotope seperation, and a number of specific types of lasers are discussed. DOE

**N83-23406#** Texaco, Inc., Montebello, Calif.
**GASIFICATION OF RESIDUAL MATERIALS FROM COAL LIQUEFACTION: TYPE-3 EXTENDED PILOT-PLANT EVALUATION OF A MOLTEN EXXON DONOR SOLVENT (EDS) LIQUEFACTION PROCESS RESIDUE FROM ILLINOIS NO. 6 COAL**
A. M. Robin and H. L. Yang Aug. 1982 67 p
(Contracts DE-AC01-76ET-10137; EX-76-C-01-2247)
(DE82-019929; DOE/ET-10137/T4; FE-1147-30) Avail: NTIS HC A04/MF A01

A type three extended pilot plant evaluation of EDS vacuum residue, which was obtained from the liquefaction of Illinois No. 6 coal at a coal liquefaction pilot plant, was successfully completed. A total of forty-four tons of EDS residue was gasified during five runs which were carried out at 1200 psig in the pilot plant residue gasifier. The solvent dilution levels, the steam to residue ratio and the oxygen to residue ratio were varied to determine optimum operating condition. A total of 97 hours of onstream time was accumulated. The longest continuous run was 28 hours. DOE

**N83-23407#** Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
**SILICON ELECTROREFINING USING A SEMIPERMEABLE Cu SUB 3 SISI ANODE**
J. M. Olson, K. Carleton, and A. Kibbler Sep. 1982 7 p refs Presented at the 16th IEEE Photovoltaics Specialists Conf., San Diego, Calif., 28-30 Sep. 1982
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE83-002095; SERI/TP-212-1749; CONF-820906-23) Avail: NTIS HC A02/MF A01

A silicon permeable anode material was developed that significantly enhances the effectiveness of a molten salt silicon electrorefining process and permits the low temperature fabrication of silicon anode plates, a prerequisite for the operation of an efficient, multiple electrorefining process. Using metallurgical grade silicon (mgSi) as a feedstock, this hybrid process has yielded 99.9996+% pure silicon in a stable, poly or single crystalline form and is particularly effective at removing boron, phosphorus, aluminum, and iron. DOE

**N83-23408#** California Univ., Livermore. Lawrence Livermore Lab.
**PYROLYSIS KINETICS FOR WESTERN AND EASTERN OIL SHALE**
Alan K. Burnham, Jeffrey H. Richardson, and Thomas T. Coburn (Kentucky Univ., Lexington) May 1982 7 p refs Presented at

the 17th Intersoc. Energy Conversion Eng. Conf., Los Angeles, 8 Aug. 1982
(Contract W-7405-eng-48)
(DE82-016002; UCRL-87587; CONF-820814-3) Avail: NTIS HC A02/MF A01

Oil yield and kinetic results are reviewed for Western (Colorado Mahogany zone) and Eastern (Sunbury and Ohio [Cleveland member]) oil shales for conditions ranging from those encountered in in-situ processing to those in fluidized-bed retorting. We briefly summarize kinetic models for the pyrolysis reactions. Oil yields from Eastern shale are much more sensitive to pyrolysis conditions than Western shale. DOE

**N83-23409#** Texas Univ., Austin. Dept. of Chemical Engineering.
**THE FISCHER-TROPSCH SYNTHESIS OVER IRON CATALYSTS: THE USE OF REACTIVE SCAVENGERS TO IDENTIFY REACTION INTERMEDIATES**
C. Z. J. Wang and J. G. Ekerdt 1982 32 p refs Presented at Ann. Meeting of Heat Transfer and Energy Conversion, Los Angeles, 14 Nov. 1982
(Contract DE-AS05-80ER-10720)
(DE82-019549; DOE/ER-10720/4; CONF-821106-3) Avail: NTIS HC A03/MF A01

The synthesis of hydrocarbons from H2 and CO was studied on a silica supported iron catalyst. The synthesis was carried out at 1.54 atmospheres and 200 to 255 deg C in a differential reactor. The working catalyst is realized by transforming Fe2O3 into a mixture of bulk carbides and iron under synthesis conditions. After the catalyst achieves a steady state condition pulses of a helium stream saturated with pyridine are injected into the reactant gas mixture. The reactor effluent is found to contain alkylpyridines. These are argued to result from pyridine reacting with the alkyl fragments which are formed on the catalyst surface from H2 and CO. The distribution of alkylpyridines is related to the synthesis product distribution as a means of gaining insight into the synthesis mechanism. DOE

**N83-23410#** Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
**THE SERI HIGH-PRESSURE, MOLECULAR-BEAM MASS-SPECTROMETRIC SAMPLING SYSTEM**
Michael N. Soltys and Thomas A. Milne Sep. 1982 38 p refs
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE83-001233; SERI/TR-622-1172) Avail: NTIS HC A03/MF A01

The theory of high pressure, molecular beam mass spectrometric sampling is briefly reviewed, with a discussion of the principal phenomena that affect results. The hardware and circuits of the sampling and data acquisition system are described. Finally, system performance and capability are reviewed. Representative data outputs are included. DOE

**N83-23411#** Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
**BIOMASS ELECTROCHEMICAL RESEARCH AT SERI**
Helena L. Chum Jun. 1982 14 p refs Presented at the SERI Biomass Principal Invest. Rev. Meeting, Washington, D.C., 23-25 Jun. 1982
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE82-019101; SERI/TP-234-1650; CONF-820676-3) Avail: NTIS HC A02/MF A01

Electrochemical processing is being applied to biomass and derived materials to upgrade their energy content thereby generating fuels (or additives) or petrochemical substitutes, or increasing their reactivity and value for a variety of applications of the polymeric materials. The utilization of the following are addressed: (1) lignin polymers, which are not suitable substrates for anaerobic digestion to fuels and chemicals. The approach is to investigate relatively simple lignin derived materials which, in principle, can be produced in large quantities, and serve as models for the behavior of more complex materials. The lignin of choice is derived from an atypical and abundant hardwood such as aspen (Populus tremuloides), which has been pretreated by explosive depressurization (steam explosion) and is ethanol extracted. The aim is to change the degree of polymerization of these materials, and to increase their suitability as a replacement of phenol in phenol-formaldehyde thermosetting resins. DOE

**N83-23412#** Energy and Environmental Research Corp., Irvine, Calif.
**SOOT FORMATION IN SYNTHETIC FUEL DROPLETS**
G. England, J. Kramlich, Y. Kwan, and R. Payne Aug. 1982 17 p
(Contract DE-AC22-80PC-30298)
(DE82-020992; DOE/PC-30298/T8; QTPR-7) Avail: NTIS HC A02/MF A01

This present research program investigates the details of soot formation from liquid fuel droplets and provides information on methods of minimizing soot formation during synthetic liquid fuel combustion under conditions which minimize the formation of nitric oxides. The program comprises two main tasks, Fuel Screening Studies and Flame Studies. The purpose of the first task is to investigate the impact of fuel properties on particulate production, to establish the importance of droplet size and examine atomizer effects, and to develop techniques for surrogate fuels production. In the second task, fundamental details of soot formation from synfuel droplet combustion will be investigated in variable slip velocity configurations. DOE

**N83-23413#** Battelle Pacific Northwest Labs., Richland, Wash.
**AMINE-ENHANCED PHOTODEGRADATION OF POLYCHLORINATED BIPHENYIS Final Report**
J. M. Meuser and W. C. Weimer Jul. 1982 57 p refs Sponsored by EPRI
(Contract DE-AC06-76RL-01830; EPRI Proj. 1263-6)
(DE82-021378; EPRI-CS-2513) Avail: NTIS HC A04/MF A01

Uncontrolled releases of polychlorinated biphenyls (PCBs) from transformers and capacitors pose a significant environmental problem to the electric utility industry. A series of experiments whose objective was to demonstrate the practicality of using natural solar radiation in conjunction with the application of an amine for in situ degradation of PCBs in contaminanted soil are described. The soil tested was clay from beneath a capacitor rack at a pacific northwest utility substation. While no degradation of the PCBs in soil was found after two weeks of sunlight exposure, further solution experiments indicate that degradation of PCBs does occur in the prescence of an amine and simulated solar radiation. In hexane solutions containing 1 ppM aroclor 1268 with 10 and 100 ppM ethylenediamine, 37% and 53% reductions in PCB concentration, respectively, were found after 70 h of solar simulator irradiation. These results suggest that the clay matrix or othe soil components may have interfered with the photodegradation process. DOE

**N83-23414#** Sandia Labs., Albuquerque, N. Mex. Explosives Testing Organization 1533.
**THE FRANK-KAMENETSKII PROBLEM REVISITED. PART 3: THE MOVING-FLAME FRONT**
W. Gill, A. R. Shouman (New Mexico State Univ., Las Cruces), and A. B. Donaldson (Enhanced Energy Systems, Inc.) Mar. 1982 29 p refs
(Contract DE-AC04-76DP-00789)
(DE82-014523; SAND-79-1625) Avail: NTIS HC A03/MF A01

The basic flame propagation theory is modified to show that flame behavior can be predicted in a two zone flame structure without eliminating the ignition temperature. The ignition temperature can be retained when the inert zone maintains the reaction zone in a critical condition. Thus, by retaining the ignition temperature and by maintaining the integrity of the zone matching equations, the two step flame model developed predicts flame behavior in either zone. DOE

**N83-23415#** Bureau of Mines, Pittsburgh, Pa. Research Center.
**FLAMMABILITY OF MIXED GASES**
D. S. Burgess, A. L. Furno, J. M. Kutchta, and K. E. Mura Sep.

1982 25 p refs
(PB83-129510; BM-RI-8709) Avail: NTIS HC A02/MF A01 CSCL 21B

About 100 tests of flammability were carried out with H2, CH4, and CO in mixtures with air using the Federal Bureau of Mines 12-ft-diameter spherical pressure vessel as an explosion test chamber. The LeChatelier approximation gave slightly conservative estimates of the limits of downward flame propagation (onset of significant pressure rise) using the following measured values for the individual gases, in percent: H2, 8.5; CH4, 5.25; CO, 13.0 No justification could be offered for using the LeChatelier law for upward flame propagation limits and indeed reported data suggest that calculated values would not be conservative. The observed upward limit for methane-air mixtures (4.85 pct) was less than the widely accepted lean limit for this fuel; those for lean hydrogen-air mixtures and carbon monoxide-air mixtures did not differ from the lowest accepted values. Diffusional effects on the propagation of single, binary, and ternary fuel mixtures are discussed.
Author (GRA)

**N83-23416#** Illinois State Geological Survey, Champaign.
**FORMS AND VOLATILITIES OF TRACE AND MINOR ELEMENTS IN COAL. 1. A COMPARISON OF THREE PYROLYSIS UNITS. 2. FEASIBILITY OF A GRAPHIC TRAPPING SYSTEM Environmental Geology Notes.**
Richard A. Cahill, Richard H. Shiley, Neil F. Shimp, Kenneth L. Konopka, and Conrad C. Hinkley 1982 36 p refs Sponsored in part by Southern Illinois Univ.
(Contract EPA-68-02-2130)
(PB83-134569; IL/SGS/EGN-102) Avail: NTIS HC A03/MF A01 CSCL 07D

Three laboratory pyrolysis systems were used to measure the volatilities oftrace and minor elements in five coals during pyrolysis. The volatility of an element could not be predicted reliably from measures of the element's organic association. An elements's volatitity during coal pyrolysis depends not only upon the element's association or mode of occurrence but also upon physical changes within the coal and upon chemical reactions of the element with sulfur or other volatile species. Mobility may be either enhanced or inhibited depending upon whether the newly, formed compound has a higher or lower volatility than the original compound in the coal. A method of measuring element mobility during pyrolysis of coal (the graphite trap method) is described. GRA

# 26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

**N83-23417*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
**THE XPS DEPTH PROFILING AND TRIBOLOGICAL CHARACTERIZATION OF ION-PLATED GOLD ON VARIOUS METALS**
Kazuhisa Miyoshi, Talivaldis Spalvins, and Donald H. Buckley 1983 17 p refs Presented at the Intern. Conf. on Met. Coatings, San Diego, Calif., 18-20 Apr. 1983; sponsored by American Vacuum Society
(NASA-TM-83350; E-1582; NAS 1.15:83350) Avail: NTIS HC A02/MF A01 CSCL 11F

Friction properties were measured with a gold film; the graded interface between gold and nickel substrate; and the nickel substrate. All sliding was conducted against hard silicon carbide pins in two processes. In the adhesive process, friction arises primarily from adhesion between sliding surfaces. In the abrasion process, friction occurs as a result of the hard pin sliding against the film, indenting into it, and plowing a series of grooves. Copper and 440 C stainless steel substrates were also used. Results indicate that the friction related to both adhesion and abrasion is influenced by coating depth. The trends in friction behavior as a function of film depth are, however, just the opposite. The graded interface exhibited the highest adhesion and friction, while the graded interface resulted in the lowest abrasion and friction. The coefficient of friction due to abrasion is inversely related to the hardness. The greater the hardness of the surface, the lower is the abrasion and friction. The microhardness in the graded interface exhibited the highest hardness due to an alloy hardening effect. Almost no graded interface between the vapor-deposited gold film and the substrates was detected. A.R.H.

**N83-23418#** Canada Inst. for Scientific and Technical Information, Ottawa (Ontario).
**INTRINSIC DEFORMATION OF TUNGSTEN CARBIDE GRAINS IN THE SURFACE LAYER OF VARIOUS HARD METALS**
A. Marschall, W. Lode, and A. Peiter 1983 15 p refs Transl. into ENGLISH from Haerterei-Tech. Mitt. (West Germany), v. 34, no. 6, 1979 p 277-281
(NRC/CNR-55-2057; ISSN-0077-5606) Avail: NTIS HC A02/MF A01

Using the roentgenological integral procedure, the intrinsic deformation of the tungsten carbide grains close to the surface was investigated in various hard metals and following different types of treatment. The corresponding determinations of proper vectors (eigenvectors) in a layer measuring up to 0.7 microns in thickness provided certain suggestions for optimal processing procedures and heat treatments. Author

**N83-23419*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
**X-RAY PHOTOELECTRON SPECTROSCOPY AND FRICTION STUDIES OF NICKEL-ZINC AND MANGANESE-ZINC FERRITES IN CONTACT WITH METALS**
Kazuhisa Miyoshi and Donald H. Buckley Apr. 1983 19 p refs
(NASA-TP-2163; E-1349; NAS 1.60:2163) Avail: NTIS HC A02/MF A01 CSCL 11F

X-ray photoelectron spectroscopy analysis and sliding friction experiments were conducted with hot-pressed, polycrystalline Ni-Zn and Mn-Zn ferrites in sliding contact with various transition metals at room temperature in a vacuum of 30 nPa. The results indicate that the coefficients of friction for Ni-Zn and Mn-Zn ferrites in contact with metals are related to the relative chemical activity in these metals: the more active the metal, the higher is the coefficient of friction. The coefficients of friction for the ferrites correlate with the free energy of formation of the lowest metal oxide. The interfacial bond can be regarded as a chemical bond between the metal atoms and the oxygen anions in the ferrite surfaces. The adsorption of oxygen on clean metal and ferrite surfaces increases the coefficients of friction for the Ni-Zn and Mn-Zn ferrite-metal interfaces. Author

**N83-23420#** Kernforschungsanlage, Juelich (West Germany). Inst. fuer Reaktorwerkstoffe.
**INFLUENCE OF CARBURIZATION ON THE ROOM TEMPERATURE TENSILE PROPERTIES OF HIGH TEMPERATURE ALLOYS**
P. J. Ennis, D. F. Lupton, H. Nickel, and H. Schuster May 1982 65 p refs Original contains color illustrations
(Juel-1786; ISSN-0366-0885) Avail: NTIS HC A04/MF A01

The influence of both thermal exposure and carburization at 800 deg C and above on the room temperature tensile properties of INCOLOY 800 H, INCONEL 617, HASTELLOY X and NIMONIC 86 was studied and the results were compared with literature data. The room temperature ductility of INCOLOY 800 H is much less sensitive to carburization than that of the nickel based alloys. This is attributed to the greater volume fraction of carbide formed in the nickel based alloys for a particular bulk carbon content. In the nickel based alloys carbide volume fractions are higher than in IRON based alloys due to the lower solubility of carbon and to the formation of M6C carbides. The ductility of reformer and intermediate heat exchanger (IHX) tubes after long service times in a process heat high temperature reactor was estimated using carburization rates found in corrosion experiments. The data indicate that a reformer tube of INCOLOY 800 H should retain a room temperature ductility equivalent to 5% tensile elongation over the anticipated service life of 140,000 h. Author

**N83-23421#** National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.
**THE EFFECT OF SHEET THICKNESS AND LAMINATING ON THE FATIGUE RESISTANCE OF THE ALUMINUM ALLOY AL 7010 - T 73651**
W. vanderHoeven and L. Schra Mar. 1981 50 p refs
(Contract NIVR-1867)
(NLR-TR-81056-U) Avail: NTIS HC A03/MF A01

The influence of sheet thickness (2 mm and 10 mm) and the influence of laminating (5 x 2 mm) on the fatigue crack growth properties of the aluminium alloy AL 7010-T 73651 were investigated. Both constant amplitude loading and flight simulation loading were applied. All 2 mm and 10 mm thick sheets were machined from a 150 mm thick plate, i.e. there were no differences in production history between those sheets. Only for flight simulation testing a pronounced thickness effect was observed with the thinner sheet (2 mm) showing a superior behavior. It was concluded that this thickness effect is most probably the result of differences in the state of stress and is not caused by differences in production history. For flight simulation loading the fatigue resistance of the laminates was found comparable to that of the monolitic 10 mm thick sheets. For constant amplitude loading the fatigue resistance of the laminates was even lower than that of the monolitic 10 mm sheets. Author

**N83-23422#** National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.
**COARSENING AND SOLUTIONING OF PRECIPITATES IN SUPERALLOYS**
H. J. Kolkman Sep. 1981 28 p refs
(NLR-TR-81114-U) Avail: NTIS HC A03/MF A01

Coarsening and solutioning of the main strengthening phase for the majority of superalloys, the gamma prime phase, are discussed. A general prediction of coarsening rates and solutioning temperatures is possible. Author

**N83-23423#** Societe Nationale Industrielle Aerospatiale, Paris (France).
**PROPERTIES OF THICK SHEETS OF 2124 T351 ALLOY [PROPRIETES DES TOLES EPAISSES EN ALLIAGE 2124 T351]**
A. Ferran 1982 25 p In FRENCH Presented at Franco-Sovietique Symp. Groupe de Travail
(SNIAS-822-111-109) Avail: NTIS HC A02/MF A01

The 2124 T351 alloy is an optimization of 2024 T351. In relation to the base alloy, it so offers better assurance of ductility particularly in the short crosswise direction. The properties presented for this material denote a very satisfactory behavior as regards fatigue and damage tolerance. In structural applications, however, it is advisable to take into account the mediocre behavior of this type of material in stress corrosion. Transl. by A.R.H.

**N83-23424#** Aeronautical Research Inst. of Sweden, Stockholm. Dept. of Aeronautical Structure and Materials.
**FATIGUE CRACK GROWTH DATA FOR STEEL N-A-XTRA 56. PART 1: BASE MATERIAL**
Anders F. Blom Oct. 1982 29 p refs
(Contract NE-5061-015)
(FFA-TN-1982-40) Avail: NTIS HC A03/MF A01

To perform fatigue crack growth calculations of the steel rotor blades in the wind turbine system, it is essential to use relevant fatigue crack growth data. This is of particular importance in the near threshold regime due to the very large number of cycles (approximately one billion) the rotor blades have to sustain during their required lifetime of 30 years. The fatigue crack growth data obtained for the base material at three different R-values (R = 0.2, 0.5 and 0.8) is summarized. S.L.

**N83-23425#** Southwest Research Inst., San Antonio, Tex.
**CRACK TIP PLASTICITY ASSOCIATED WITH CORROSION ASSISTED FATIGUE Final Annual Report, Jun. 1981 - Sep. 1982**
D. L. Davidson and J. Lankford 15 Nov. 1982 147 p refs
(Contract N00014-75-C-1038)
(AD-A122960; FAR-7) Avail: NTIS HC A07/MF A01 CSCL 11/6

This is the seventh and final Annual Report on this research project entitled 'Crack Tip Plasticity Associated with Corrosion Assisted Fatigue.' The objective of this program has been to examine the effect of environment on the deformation response of the material near the crack tip-the plastic zone-and from that response, determine the effect of environment on fatigue crack growth. The results described in this report were obtained using essentially two techniques: the relatively new technique stereo-imaging, coupled with the use of a cyclic loading stage for the scanning electron microscope, and the now standard technique of electron fractography, using the SEM. The effect of environment on aluminum and titanium alloys was determined by analyzing cracks grown in both moist and very dry environments. GRA

**N83-23426#** Battelle Columbus Labs., Ohio.
**EFFECTS OF MANUFACTURING PROCESSES ON STRUCTURAL ALLOWABLES Final Technical Report, Sep. 1980 - Jul. 1982**
Dana J. Jones and Stephen C. Ford Wright-Patterson AFB, Ohio: AFWAL Nov. 1982 168 p
(Contract F33615-80-C-5168)
(AD-A122963; AFWAL-TR-82-4136) Avail: NTIS HC A07/MF A01 CSCL 11/6

The major objective of this program was to evaluate the effect that newly established manufacturing techniques will have on the handbook properties of structural materials which have a possible use in Air Force systems. Data sheet-type presentations of engineering properties were prepared for each material.
Author (GRA)

**N83-23427#** Cornell Univ., Ithaca, N. Y. Dept. of Materials Science and Engineering.
**LOAD-RELAXATION STUDIES OF DEFORMATION MECHANISMS AT ELEVATED TEMPERATURES**
M. A. Korhonen, R. L. Keusseyan, L. X. Li, and C. Y. Li 30 Nov. 1982 11 p refs
(Contract DE-AC02-82ER-12038)
(DE83-004498; DOE/ER-12038/4) Avail: NTIS HC A02/MF A01

Load-relaxation tests generate deformation data which are usually represented in the form of logarithmic stress-logarithmic strain-rate curves. The characteristics of these curves have been used extensively at low homologous temperatures for identifying grain-matrix-controlled deformation processes. At temperatures near and above one half of the absolute melting temperature, grain-boundary sliding and thermally induced structural changes, including grain-boundary migration, will occur. The shape of load-relaxation curves has been found to reflect the various processes involved. For example, a sigmoidal-shaped curve is seen for nickel and its alloys when the contribution of grain-boundary sliding is significant. Thermally induced structural changes can be shown to produce a sufficiently high strain-rate sensitivity index required by structural superplasticity. This report is concerned mainly with mechanisms that are important at elevated temperatures. Uses of load-relaxation data are discussed to determine the deformation and material parameters required for the characterization of these processes. DOE

**N83-23428#** Iowa State Univ. of Science and Technology, Ames. Center for Rare-Earth Information.
**CRITICAL EVALUATION OF BINARY-RARE-EARTH PHASE DIAGRAMS Progress Report, 1 Mar. - 31 May 1982**
K. A. Cscheidner, Jr. and F. W. Calderwood Jun. 1982 139 p refs Sponsored in part by NBS, Goldschmidt AG, Molycorp. Inc., Union Oil Co. of Calif., Reactive Metals and Alloys Corp., Ronson Metals Corp. and Sanotoku Metal Industry Co., Ltd.
(Contract W-7405-eng-82)
(DE83-003815; IS-RIC-PR-3) Avail: NTIS HC A07/MF A01

The gadolinium-samarium system was investigated to further the understanding of alloy formation. Variables under consideration were electronic structure, crystal structure, atomic diameter,

valences, and electronegativity. The major difference between the two components in this system is the crystal structure. Both metals are closed packed hexagonal but differ in the stacking sequence from the nine layered delta phase for samarium to normal two layered hcp for gadolinium. The effect of the difference in crystal structures on the various properties of their solid solutions was determined. DOE

**N83-23429#** Hanford Engineering Development Lab., Richland, Wash.
**MECHANICAL PROPERTIES OF HIGHLY IRRADIATED 20 PERCENT COLD-WORKED TYPE 316 STAINLESS STEEL**
M. L. Hamilton, N. S. Cannon, and G. D. Johnson 5 Apr. 1982 13 p refs Presented at the 11th Intern. Symp. on Effects of Radiation on Mater., Am. Soc. for Testing and Mater., Scottsdale, Ariz., 28-30 Jun. 1982
(Contract DE-AC06-76FF-02170)
(DE82-016262; HEDL-SA-2574-FP; CONF-820628-2) Avail: NTIS HC A02/MF A01

Recent experiments have extended the mechanical properties data base of 20 percent cold worked 316 stainless steel to a fluence of 1.3 x 10 to the 23rd power n/sq cm (E > 0.1 MeV), the goal exposure of the Fast Flux Test Facility. Both uniaxial and biaxial tests were conducted on specimens of developmental cladding which were irradiated in the Experimental Breeder Reactor-II at temperatures ranging from 370 C to 650 C. Uniaxial tensile tests were conducted at strain rates ranging from .00001/s to .001/s. Controlled biaxial strain rate (CBSR) tests, were conducted only at a strain rate of .00001/s. CBSR specimens are gas loaded to produce a constant diametral strain rate. These tests are otherwise analogous to uniaxial tensile tests. The tensile strength and ductility of the cladding were generally in good agreement with the predicted values. DOE

**N83-23430#** Oak Ridge National Lab., Tenn. Metals and Ceramics Div.
**SMALL ANGLE NEUTRON SCATTERING STUDY OF CREEP DEFORMATION AND FRACTURE TO TYPE 304 STAINLESS STEEL**
M. H. Yoo, J. C. Ogle, J. H. Schneibel, and R. W. Swindeman 1982 14 p refs Presented at the 6th Intern. Conf. on the Strength of Metals and Alloys, Melbourne, 16 Aug. 1982 Sponsored in part by NSF
(Contract W-7405-eng-26)
(DE82-020899; CONF-820808-3) Avail: NTIS HC A02/MF A01

A small angle neutron scattering (SANS) study was performed to determine the size distribution of carbide precipitates that were formed during creep deformation in Type 304 stainless steel. The hardening mechanism during primary creep by a fine dispersion of carbide particles in the matrix was confirmed by the SANS measurement and also by direct TEM observations. The size distribution of creep induced cavities was also determined by SANS measurements after post creep solution heat treatment. DOE

**N83-23431#** Oak Ridge National Lab., Tenn. Metals and Ceramics Div.
**INFLUENCE OF TRACES OF Sb AND Zr ON CREEP AND CREEP FRACTURE OF Ni-20% Cr**
J. H. Schneibel, C. L. White, and R. A. Padgett 1982 6 p refs Presented at the 6th Intern. Conf. on the Strength of Metals and Alloys, Melbourne, 16 Aug. 1982
(Contract W-7405-eng-26)
(DE82-020914; CONF-820808-2) Avail: NTIS HC A02/MF A01

The creep and creep fracture behavior of a Ni-20% Cr, a Ni-20% Cr-0.15% Sb and a Ni-20% Cr-0.11% Zr alloy are compared. Whereas Sb does not change the behavior of Ni-20% Cr, the addition of Zr leads to a pronounced reduction in the creep rate and a strong increase in the creep ductility. Analytical electron microscopy and auger analysis suggest that the segregation of S to the grain boundaries is reduced in the Zr doped alloys. Diffusional creep data show that Zr slows down the grain boundary diffusivity in Ni-Cr. These experimental findings explain qualitatively why Ni-Cr-Zr fractures in a ductile manner and does not cavitate intergranularly. DOE

**N83-23432#** Midwest Research Inst., Golden, Colo. Photovoltaic Devices and Measurements Branch.
**RF SPUTTERING OF LOW-RESISTIVITY CdS THIN FILMS**
M. Kwietniak (Polish Academy of Sciences), T. Warminski (Polish Academy of Sciences), R. Beaulieu, J. J. Loferski, P. J. Ireland, and L. L. Kazmerski Jun. 1982 5 p refs Presented at the Spring Meeting of the Electrochem. Soc., Montreal, 9-13 May 1982 Prepared in cooperation with Brown Univ., Providence, R.I.
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE82-020507; SERI/TP-213-1618; CONF-820508-4) Avail: NTIS HC A02/MF A01

The compositional, structural and electrical properties of low-resistivity RF-sputtered CdS thin films are investigated. The low-resistivity (<1 Omega-cm) results from preparing sulfur-deficient CdS targets by heating in pure hydrogen. The films are characterized by SEM, EDAX, EMPA and SAM for compositional and structural properties. Four point and thermal probes are used in the electrical characterization. DOE

**N83-23433#** Oak Ridge National Lab., Tenn. Metals and Ceramics Div.
**EXAMINATION OF BIMETALLIC INCONEL 600/316 STAINLESS STEEL**
J. H. DeVan, G. M. Slaughter, G. M. Goodwin, and B. C. Leslie 1982 4 p ref Presented at the Am. Nucl. Soc. Ann. Meeting, Los Angeles, 6 Jun. 1982
(Contract W-7404-eng-26)
(DE82-017449; CONF-820609-51) Avail: NTIS HC A02/MF A01

A bimetallic sodium heated steam generator that developed a massive sodium to water leak during performance testing was examined. The morphology of the crack systems in stainless sections of the upper and lower tube sheets was indicative of a stress corrosion failure mode. DOE

**N83-23434#** General Electric Co., Schenectady, N. Y. Corporate Research and Development.
**EFFECTS OF NITROGEN AND COLD WORK ON THE SENSITIZATION OF AUSTENITIC STAINLESS STEELS Final Report**
C. L. Briant Jun. 1982 42 p refs Sponsored by EPRI
(EPRI Proj. 1574-1)
(DE82-905766; EPRI-NP-2457) Avail: NTIS HC A03/MF A01

The effects of nitrogen and molybdenum additions and the effects of cold work on the sensitization of unstabilized austenitic stainless steels are addressed. The results show that nitrogen and molybdenum are beneficial elements. Cold work prior to sensitization is very detrimental if it induces martensite. The presence of martensite is harmful because the diffusion coefficients of chromium and carbon are much greater in the body centered tetragonal martensite than in the face centered cubic austenite. Consequently, sensitization can occur very rapidly within martensite. This occurrence is particularly noticeable at temperatures below the nose of the time temperature sensitization curve for a completely austenitic alloy. Grinding of surfaces produces martensite. This deformation induced martensite could sensitize at 288 C within 2 to 10 years. DOE

**N83-23435#** Los Alamos Scientific Lab., N. Mex.
**NONCONVENTIONAL HARD-METAL COMPOSITIONS**
Haskell Sheinberg 1982 10 p Presented at the 6th Intern. Conf. on Powder Met., Brno, Czechoslovakia, 10-12 Nov. 1982
(Contract W-7405-eng-36)
(DE82-014051; LA-UR-82-1140; CONF-821102-1) Avail: NTIS HC A02/MF A01

A novel hard-metal composition comprising borides and carbides of tungsten, nickel, and iron is made by reaction hot-pressing mixtures of elemental tungsten, nickel, and iron powders with small quantities of boron carbide. The hardness of these compositions is in the range of the hardest conventional tungsten carbide-cobalt compositions. It was subsequently determined that molybdenum can be substituted in part or totally for

the tungsten in the composition with a minimum reduction in hardness. This new composition can be used in high-pressure anvils; it sustains higher pressures than commercial carbides without plastic deformation. DOE

**N83-23436#** Belgrade Univ. (Yugoslavia). Lab. for Electrochemical Energy Conversion.
**ELECTROCHEMICAL PROPERTIES OF ALLOYS OF ALUMINUM WITH GALLIUM AND PHOSPHORUS Final Report, 1981-1982**
Jun. 1982 149 p refs
(Contract W-7405-eng-48)
(DE83-000599; UCRL-15481) Avail: NTIS HC A07/MF A01

This project is directed toward mastering the method of obtaining GAPAL (gallium phosphorus alloy of aluminum) sheets 2 to 8 mm thick in a reproducible manner possessing electrochemical properties acceptable for the use in ALAIR (aluminum-air) batteries. The specific program designed for the research period of 1 year was as follows: (1) a number of alloy samples were to be made from high purity aluminum (99.999%) in the form of blocks 50 x 50 x 5 mm by splat cooling from the melt, so as to cover a range of gallium and phosphorus contents; (2) the samples were to be submitted to the full range of electrochemical investigations; (3) the composition exhibiting most favorable characteristics (largest quality number) was to be submitted to the metallurgical characterization; (4) technical grade aluminum (99.5 and 99.8%) was to be collected from different sources, and submitted to impurity analysis with the tendency to obtain the base metal in a spectrum of impurity contents; (5) the alloy of the most favorable composition was to be made in a number of samples using different base metals; and (6) electrochemical and metallographic investigations were to be carried out in order to learn about the effect of impurities on the characteristics of the alloy. DOE

**N83-23437#** Virginia Polytechnic Inst. and State Univ., Blacksburg. Coll. of Engineering.
**IMPORTANCE OF STRESS STATE ON HYDROGEN EMBRITTLEMENT**
M. R. Louthan, Jr., R. P. McNitt, and R. D. Sisson 1982 18 p refs Presented at the TMS/AIME Fall Meeting on Advanced Tech. for the Characterization of Hydrogen in Metals., Louisville, Ky., 11 Oct. 1981
(Contract DE-AS05-78ER-06039)
(DE83-001158; CONF-811037-4) Avail: NTIS HC A02/MF A01

The accurate assessment of the compatibility of metals and alloys with in-service hydrogen environments requires the ability to extrapolate short term laboratory test data to long term engineering applications. This extrapolation frequently requires the use of tensile and subsized fracture mechanics specimens to predict the behavior of large scale structural components. Both macroscopic and microscopic stress states in the test specimens may be quite different from those in the structural component; thus it is vital to understand the potential roles of stress state in the hydrogen embrittlement process. The importance of stress state in the assessment of hydrogen compatibility is demonstrated. Safe, efficient materials utilization design data must be based on the results of several types of mechanical tests. DOE

**N83-23438#** California Univ., Berkeley. Lawrence Berkeley Lab. Dept. of Materials Science and Mineral Engineering.
**QUANTITATIVE ANALYSIS OF FRACTURE MODES IN CRYOGENIC NI-6 STEEL BY STEREO SEM TECHNIQUE M.S. Thesis**
Gianni O. Fior Jun. 1982 58 p refs
(Contract DE-AC03-76SF-00098)
(DE83-000500; LBL-14751) Avail: NTIS HC A04/MF A01

Systematic three dimensional (3D) quantitative analyses of fracture surface on Ni 6 cryogenic steel are used to study the effect of temperature variations on the geometrical factors that describe the shape of ductile dimples (DD) and quasicleavage (QC) facets. Stereo SEM techniques combined with stereophotogrametry provide the tools with appropriate instrumentation over a 300 degrees temperature range. Mechanical properties and tridimensional geometrical factors are found to be intimately related. The influence of temperature on DD and QC is considerably different, showing that quasicleavage is a transitional fracture mechanism that serves as a link between ductile and cleavage fracture. DOE

**N83-23439#** Dayton Univ., Ohio. Dept. of Chemistry.
**LOW-TEMPERATURE OXYGEN DIFFUSION IN ALPHA TITANIUM CHARACTERIZED BY AUGER-SPUTTER PROFILING**
T. N. Wittberg, J. D. Wolf, R. Gerald Keil, and Pu Sen Wang (Mound Lab.) 1982 17 p refs Presented at 29th Natl. Symp. on Am. Vacuum Soc., Baltimore, 16 Nov. 1982
(Contract DE-AC04-76DP-00053)
(DE82-021312; MLM-2996-OP; CONF-82111-4) Avail: NTIS HC A02/MF A01

Anodic TiO2 films were grown on titanium foils under galvanostatic conditions at 20 mA/sq cm in an aqueous saturated solution of ammonium tetraborate. The samples were heat treated at temperatures between 450 and 550 C and changes in the profile of oxygen concentration as a function of depth were monitored using AES. The oxygen diffusivities were calculated from the Boltzmann-Matano method and compared with those obtained using an analytical solution to Fick's Second Law. The activation energy for oxygen diffusion in this temperature range was calculated to be 28 kcal/mole. DOE

**N83-23440#** Brookhaven National Lab., Upton, N. Y.
**OPTICAL-MODEL CALCULATIONS FOR THE CHROMIUM, IRON, AND NICKEL ISOTOPES IN THE ENERGY RANGE OF 0.5 TO 100.0 MeV**
A. Prince 1982 7 p refs Presented at the Nucl. Data for Sci. and Technol. Intern. Conf., Antwerp, 6-10 Sep. 1982
(Contract DE-AC02-76CH-00016)
(DE83-000711; BNL-NCS-31877; CONF-820942-15) Avail: NTIS HC A02/MF A01

Optical model calculations have been carried out for the Cr, Fe and Ni isotopes at energies just above the resolved resonance region (0.5 to 0.7 MeV) to the high energy (100.0 MeV) region. A consistent set of O.M. parameters that covered this region produced in addition to the S and P wave strength functions the total elastic and differential angular distributions that was in very good agreement with the experimental data. Reproduction of the broad maxima and minima (Nuclear Ramsauer Effect) in addition to S0, S1 and R were the established contraints for this analysis. DOE

**N83-23441#** Oak Ridge National Lab., Tenn. Solid State Div.
**RELEASE OF ION-IMPLANTED AND TRANSMUTATION-PRODUCED HELIUM FROM NICKEL**
D. B. Poker and J. M. Williams Oct. 1982 24 p refs Presented at the Intern. Symp. on Helium in Metals, Juelich, West Germany, 21 Sep. 1982
(Contract W-7405-eng-26)
(DE82-022266; CONF-820952-1-Draft) Avail: NTIS HC A02/MF A01

Measurements of He release were performed on Ni samples doped by thermal neutron irradiation or ion implantation. Closed and open cylinders of Ni were neutron irradiated at 100 C. The amount of He released into the interior of the closed cylinders was equivalent to that produced in the volume of Ni within about 0.5 microns of the surface, indicating a significant mobility at room temperature. The open cylinders were heated in vacuum while the He release was measured. Below 1000 C, the amount of He released was equivalent to that produced within 0.02 microns of the surface. He release from Ni at temperatures between 18 and 600 K was measured after ion implantation of 35 KeV He plus at 18 K. The only significant release was sharply peaked near 50 K. DOE

**N83-23442#** Cincinnati Univ., Ohio. Dept. of Materials Science and Metallurgical Engineering.
**PNEUMATIC EROSION EFFECTS ON MICROSTRUCTURE OF METALS AND ALLOYS Progress Report, 1 Jan. - 30 Apr. 1982**
J. Moteff 19 Jul. 1982 18 p refs

(Contract DE-FG22-81PC-40794)
(DE82-020976; DOE/PC-40794/2) Avail: NTIS HC A02/MF A01

Microhardness as a function of temperature for AISI 304 stainless steel, Al 2024-T6 and the superalloy IN 718 is established. A correlation was sought between hardness and erosion rate at temperatures above room temperature. Erosion rate data on the three materials at various temperatures, particle velocities and angles of impingement from 25 deg to 90 deg were provided. The volume erosion rates normalized to a velocity of 183 m/s (600 f/s) showed an increased dependency on the microhardness, epsilon alpha H/sub v//sup -b/, where epsilon is the vol-erosion rate, H/sub v/ the microhardness and b a constant greater than 1.0 for IN 718 and 304 SS, and less than 1.0 for 2024 Al. Also, the velocity (v) dependence, epsilon alpha v/sup n/, showed a decreasing n (n < 20) with increasing temperature, more evident above about 0.5 T/sub M/(T/sub M/ = melting temperature, K). DOE

**N83-23443#** Oak Ridge National Lab., Tenn. Dept. of Computer Sciences.
**MUXS: A CODE TO GENERATE MULTIGROUP CROSS SECTIONS FOR SPUTTERING CALCULATIONS**
T. J. Hoffman, M. T. Robinson, and H. L. Dodds, Jr. (Tennessee Univ., Knoxville) Oct. 1982 71 p refs
(Contract W-7405-eng-26)
(DE83-000221; ORNL/CSD/TM-185) Avail: NTIS HC A04/MF A01

This report documents MUXS, a computer code to generate multigroup cross sections for charged particle transport problems. Cross sections generated by MUXS can be used in many multigroup transport codes, with minor modifications to these codes, to calculate sputtering yields, reflection coefficients, penetration distances, etc. DOE

**N83-23444#** Electric Power Research Inst., Palo Alto, Calif.
**PROCEEDINGS OF THE 2ND CONFERENCE ON ADVANCED MATERIALS FOR ALTERNATIVE-FUEL-CAPABLE HEAT ENGINES**
May 1982 895 p refs Conf. held at Monterey, Calif., 24-28 Aug. 1981 Sponsored in part by DOE and EPRI
(DE82-018875; EPRI-RD-2369-SR; CONF-810885) Avail: NTIS HC A99/MF A01

The problems that may be encountered by structural materials in heat engine systems burning alternative fuels are addressed. The problems for heat engines in the change to these different fuels are primarily related to impurities, both those whose role is chemical, in increasing the corrosion of materials, and those that appear as solid or liquid particles in the combustion gases and may erode or deposit on component surfaces. A difficulty is that the impurities that may be present in the newer fuels when they appear in the market cannot be predicted with confidence; both the amount and the nature of the impurities will be a function of the preparation methods. The principal areas of concern are gas turbines and diesels, but heat exchangers and direct combustion of coal are also discussed. Metallic materials, structural ceramics, and coatings are included; advanced cooling techniques, which may reduce problems of the interaction of the materials with their environment at the expense of greater fabrication problems, are also reviewed. DOE

**N83-23445#** California Univ., Berkeley. Lawrence Berkeley Lab. Nuclear Science Div.
**ZERO-FIELD SPIN RELAXATION OF THE POSITIVE MUON IN COPPER Ph.D. Thesis**
Carl William Clawson Jul. 1982 102 p refs
(Contract DE-AC03-76SF-00098)
(DE82-020542; LBL-14489) Avail: NTIS HC A06/MF A01

The spin relaxation of the positive muon in high purity single crystal and polycrystalline copper was measured at temperatures between 0.5 K and 5.2 K by the zero-field positive muon SR technique. In both types of sample, the experiments show a temperature independent dipolar width delta/sub z/ = 0.389 + or - 1/0.003 microns and a hopping rate decreasing from approximately 1/0.5 microns at 0.5 K to approximately 1/0.05 microns above 5 K. This is the first direct proof of a dynamic effect in the low temperature positive muon spin relaxation in copper. The relationship between the zero-field and transverse-field dipolar widths is discussed, and the measured zero-field width is found to be approximately 10% larger than expected based on the known transverse-field widths. A new positive muon SR spectrometer was constructed and used in this work. The spectrometer and the associated beam lines and data acquisition facilities are discussed. DOE

**N83-23446#** National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.
**INFLUENCE OF ENVIRONMENTS ON CONSTANT DISPLACEMENT: STRESS CORROSION CRACK GROWTH IN HIGH STRENGTH ALUMINUM ALLOYS**
L. Schra and J. Faber Sep. 1981 50 p refs
(Contract NIVR-1868)
(NLR-TR-81138-U) Avail: NTIS HC A03/MF A01

An experimental investigation was carried out into the applicability of various corrosive environments for stress corrosion crack propagation testing of high strength aluminium alloys using double cantilever beam specimens. Testing under atmospheric conditions was used as a reference. It was found that stress corrosion crack growth under atmospheric conditions was influenced by the wedging action of corrosion products, making the determination of a threshold stress intensity factor less relevant. Corrosion product wedging was particularly important for testing by periodic moistening with a 3.5% NaCl solution. It crack growth promoting effect is advantageous for distinguishing differences between SCC resistant alloys. The crack growth behavior under atmospheric conditions was reflected best by alternate immersion in synthetic seawater. The amount of SCC growth found for continuous immersion in an acidified salt-chromate solution proved to be too small to distinguish between alloys with intermediate and high resistance to SCC. Author

**N83-23447#** National Bureau of Standards, Washington, D.C. Center for Materials Science.
**METALLURGICAL STUDIES OF INTERFACE BONDING ON IMPLANT ALLOYS Progress Report, Oct. 1981 - Jul. 1982**
A. C. Fraker, A. W. Ruff, K. J. Bundy, S. A. DeMontigny, P. Sung, A. C. VanOrden, and K. M. Speck Oct. 1982 98 p refs
(Contract FDA-224-79-5023)
(PB83-126698; NBSIR-82-2563-FDA) Avail: NTIS HC A05/MF A01 CSCL 06L

Discussions of stress analyses in total hip replacement prostheses and the metal/bone cement interface are presented. A test which utilized loading in torsion is described. The test can be used to determine the influence of various parameters, including surface roughness and passivation and sterilization treatment on the strength of the metal/bone cement bond. Some preliminary tests were conducted and results are given. Future work using the mechanical test developed is discussed. Additional studies were conducted on the surface preparation of titanium, and data are presented to show that changes in initial electrochemical behavior and varying degrees of surface roughness occur depending on whether the metal receives a neutral, alkaline or acidic washing treatment. Author (GRA)

# 27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

**N83-23448#** Deutsches Kunststoff-Inst., Darmstadt (West Germany).
**CROSS LINKING OF POLYMERS BY HIGH-ENERGY RADIATION IN THE PRESENCE OF MONOMERS Final Report, Dec. 1980**
Wolfgang Schneider Bonn Bundesministerium fuer Forschung

und Technologie Dec. 1982 69 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-236; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 14,50

Polyethylene (PE) and poly(vinyl chloride) (PVC) are the two most important polymers used as insulating materials for cables. The formation of crosslinks in these materials is highly important from a technical point of view, since crosslinks lead to new properties and consequently to new applications. It is known that crosslinking by high-energy radiation results in better products as compared to crosslinking based on peroxides. By adding specific monomers the radiation dose required for the formation of a sufficient concentration of crosslinks can significantly be decreased in the case of PE whereas PVC can only be crosslinked in the presence of these additives. It was the purpose of this project to determine the electrical properties of radiation crosslinked PE and PVC and to investigate the influence of the specific additives on the electric properties. The stationary conductivity, the dielectric properties and the dielectric strength were studied. The electric properties of PVC were found to be independent of radiation induced crosslinks up to a radiation dose of 20 Mrad. The electric conductivity of mixtures of PE with specific additives (cyanurates, acrylates) on the other hand were increased by a factor of 10 under identical radiation conditions as compared to original material. The dielectric loss was observed to be influenced by the radiation much stronger than the dielectric constant. The dielectric strength decreased due to the radiation. Author

**N83-23449#** Rosenthal-Stemag, Technische Keramik A.G., Selb (West Germany).
**CERAMIC MATERIALS FOR NEW COMBUSTION DEVICES FOR BURNING LIQUID FUELS, ESPECIALLY LIGHT OIL Final Report, Jun. 1981**
Stefan Schindler Bonn Bundesministerium fuer Forschung und Technologie Dec. 1982 83 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-240; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 17,50

Form optimization of the ceramic combustion nozzle, test and functional optimization of the ceramic combustion nozzle under, working conditions in the laboratory and in extended field-tests, and elaboration of a suitable production technique (injection moulding) for ceramic combustion nozzles are described. Author

**N83-23450#** Royal Inst. of Tech., Stockholm (Sweden). Dept. of Technical Acoustics.
**DYNAMIC MECHANICAL DATA OF NON-REINFORCED PLASTICS**
Kjell Lundin Dec. 1982 146 p refs
(Grant STU-81-4519)
(TRITA-TAK-8203; ISSN-0280-2082) Avail: NTIS HC A07/MF A01

Information concerning dynamic mechanical properties of plastics is presented. The need of efforts to supply this kind of information is emphasized e.g. by Gadefelt 1981 and Richards 1981. Engineering design problems that require consideration of material damping properties include: mechanical resonance and fatigue; acoustical response and fatigue; noise generation; vibration, shock and noise isolation, and heating under cyclic stress. Dynamic properties measurements are also valuable research tools for physical chemists. S.L.

**N83-23451#** State Univ. of New York, Albany. Dept. of Physics.
**SUNY/ALBANY GLASS STUDY GROUP, 1981 - 1982 Annual Report**
W. A. Lanford and C. Burman 1982 36 p
(AD-A123119) Avail: NTIS HC A03/MF A01 CSCL 11/2

Glass is one of the most durable materials commonly made. Both the chemical durability and the fracture strength of glass are largely determined by chemical reactions occuring at the glass surface. Under most conditions, it is reactions between the glass and water or aqueous solutions that are the leading steps in surface degradation. GRA

**N83-23452#** Massachusetts Univ., Amherst. Dept. of Polymer Science and Engineering.
**STRUCTURAL INVESTIGATIONS OF FIBERS AND FILMS OF POLY(P-PHENYLENE BENZOBISTHIAZOLE), VOLUME 1 Interim Report, 1 Sep. 1978 - 1 May 1982**
John R. Minter Wright-Patterson AFB, Ohio AFWAL May 1982 238 p refs
(Contract F33615-78-C-5175; AF Proj. 2419)
(AD-A122890; AFWAL-TR-82-4097-Vol-1) Avail: NTIS HC A11/MF A01 CSCL 11/9

Dry-jet-wet spun poly(p-phenylene benzobisthiazole) (PBT) fibers and films were studied to determine how such wholly aromatic molecules are arranged in the solid state. The effect of processing variables on microstructure was also investigated. Fragments obtained by detachment replication of bulk samples were quite resistant to electron beam damage compared to aliphatic polymers. A characteristic dose of 1.6 Coul sq/cm decreases the intensity of the (010) reflection to 37% of its initial value. GRA

**N83-23453#** Michigan Univ., Ann Arbor.
**KINETICS OF STRAININDUCED CRYSTALLIZATION OF POLYMERS DURING FLOW Final Report, 1 Dec. 1978 - 31 Aug. 1982**
G. S. Y. Yeh Dec. 1982 22 p refs
(Contract DAAG29-81-C-0026; Grant DAAG29-79-G-0029)
(AD-A122904; ARO-15299.1-MS) Avail: NTIS HC A02/MF A01 CSCL 20/2

Results from experimental studies of strain-crystallized polyethylenes, prepared in a simple shear couette rheometer, indicate a substantial increase in nucleation rate, a decrease in long period, as well as an increase in melting temperature with increasing shear. The changes appear to have the same thermodynamic origin in the reduction of the amount of melt entropy, Delta S', just prior to crystallization according to a strain-induced crystallization theory by Yeh and Hong. Consequently from the measured nucleation rate one can predict what the decrease in long period or the increase in melting temperature should be for a given strain-crystallized polyethylene. For example, the measured melting temperatures are indeed shown to be comparable to those predicted from nucleation rate measurements. GRA

**N83-23454#** SRI International Corp., Menlo Park, Calif.
**ENERGETIC THERMOPLASTIC ELASTOMERS Final Report, 15 Nov. 1981 - 14 Nov. 1982**
G. E. Manser and D. L. Ross 15 Dec. 1982 33 p refs
(Contract N00014-82-K-0045)
(AD-A122909) Avail: NTIS HC A03/MF A01 CSCL 11/9

The objective of the research was to investigate the synthesis and polymerization of energetic and nonenergetic monomers to provide thermoplastic elastomers for use as binders in solid gun propellants and cast-cured explosives. The polymer systems investigated were designed to meet the requirements of the Navy's LOVA (low vulnerability ammunition) program. Author (GRA)

**N83-23455#** Case Western Reserve Univ., Cleveland, Ohio. Dept. of Macromolecular Science.
**THE USE OF INFRARED METHODS TO STUDY POLYMER INTERFACES**
S. R. Culler, H. Ishida, and J. L. Koenig 9 Dec. 1982 41 p refs
(Contract N00014-80-C-0533; NR Proj. 356-739)
(AD-A123021; CWRU/DMS/TR-7) Avail: NTIS HC A03/MF A01 CSCL 11/9

The surfaces of polymers and interfacial reactions between polymers and other materials are of much interest to the coatings and adhesive industries. There are many techniques which are available to study these surfaces, but none can yield as much information about the chemical nature of polymer surfaces as

infrared spectroscopy. In the past, such studies were severely limited by a lack of specialized surface-specific IR techniques for the study of opaque samples or samples with small quantities (monolayer amount) of surface species. With the development of Fourier infrared spectroscopy (FT-IR), this situation has changed. The increased sensitivity, selectivity, energy throughput, reproducibility, and the computerization of the FT-IR technique now allow the spectroscopists to probe the chemical nature of polymer surfaces routinely. Author (GRA)

**N83-23456#** Bendix Corp., Kansas City, Mo.
**SYNTHESIS AND CHARACTERIZATION OF DIALLYL PHTHALATE PREPOLYMERS Final Report**
G. K. Baker and B. G. Parker Dec. 1982 23 p refs
(Contract DE-AC04-76DP-00613)
(DE83-004945; BDX-613-2848) Avail: NTIS HC A02/MF A01

Methods for the laboratory synthesis of diallyl phthalate prepolymers were evaluated. The chemical, physical, and molecular weight properties of several prepolymers synthesized were also evaluated and compared to those properties exhibited by Dapon 35 and Daiso 35, manufactured by FMC Corporation and Osaka-Soda, respectively. Glass-filled molding compounds from four of the prepolymers having molecular weight distributions ranging from 1.9 to 40.2 were prepared and tested at the Monsanto Research Corporation, Mound Facility. The processing characteristics nd physical and electrical properties of two molding compounds were found to be comparable to similar compounds made from Dapon 35 and Daiso 35. DOE

**N83-23457#** Purdue Univ., Lafayette, Ind.
**FREQUENCY EFFECT ON THE FATIGUE LIFE OF [+45]/SUB 25/S2 GLASS-EPOXY**
C. T. Sun, J. F. Doyle, and G. C. Tsai Jul. 1982 31 p refs
(Contract W-7405-eng-48)
(DE82-021384; UCRL-15487; CML-82-3) Avail: NTIS HC A03/MF A01

Fatigue tests were conducted on [+45]/sub 25/ glass/epoxy composite laminates using 4, .4, and .04 Hz frequencies. Fatigue life was found to increase as the load frequency increased. The frequency dependent behavior of the dynamic modulus was used to interpret the frequency dependent fatigue life. Experimental results showed that the dynamic modulus of this composite is larger at higher frequencies. When the fatigue load was adjusted according to the frequency so that the same strain amplitude was applied at different frequencies, fatigue life became less dependent on the frequency. DOE

**N83-23458#** Oak Ridge National Lab., Tenn. Metals and Ceramics Div.
**IRRADIATION-INDUCED PERMEABILITY IN PYROCARBON COATINGS. WORK CONDUCTED UNDER PWS FD-12 Final Report**
M. J. Kania, B. A. Thiele, and F. J. Homan Oct. 1982 112 p refs
(Contract W-7405-eng-26)
(DE83-001722; ORNL/TM-8348) Avail: NTIS HC A06/MF A01

Irradiation induced permeability in pyrocarbon coatings was investigated. The data was examined to define the onset of neutron induced permeability in a variety of Biso coatings produced with different process variables (coating temperature, coating gases, and coating rates). The effort was not successful. None of the preirradiation characterization procedures were able to adequately predict irradiation performance. A large amount of within batch scatter was observed in the fission gas and cesium release data along with significant within batch variation in coating properties. Additional preirradiation characterization might result in a procedure that could successfully predict irradiation performance, but little was done about the within batch variation in coating properties. This variation is probably the result of random movement of particles within the coating furnace during pyrocarbon deposition. Author

**N83-23459#** Bendix Corp., Kansas City, Mo.
**SHELF-LIFE CHARACTERIZATION OF ADHESIVES Final Report**
J. S. Tira Sep. 1982 24 p refs
(Contract DE-AC04-76DP-00613)
(DE82-021306; BDX-613-2834) Avail: NTIS HC A02/MF A01

The shelf life and storage condition characteristics of six epoxy film adhesives used in electronic applications were evaluated. Three important temperature points that occur during the cure of the epoxy adhesives were determined. The results obtained using differential scanning calorimetry (DSC) were sensitive to sample weight material history, and instrument settings. Kinetic data was collected to evaluate the stability of frozen epoxy film adhesives. The reaction order could not be calculated with any degree of certainty even after performing numerous DSC tests using different heating rates and isothermal heating. Thus, kinetic data could not be calculated. DOE

**N83-23460#** California Univ., Livermore. Lawrence Livermore Lab.
**SCANNING-ELECTRON-MICROSCOPY STUDY OF CORROSION AND SURFACE FEATURES IN GLASS MICROBALLOONS**
R. L. Bystroff 15 Sep. 1982 16 p refs
(Contract W-7405-eng-48)
(DE83-000657; UCID-19557) Avail: NTIS HC A02/MF A01

Gaseous acid treatment (HBr) of surface hardened binary glass microballoons results in etching and the growth of salt nodules, tubes or whiskers, depending on moisture conditions. Temperatures from 400 C to 625 C for 24 h or more are required for the effects to be significant. Numerous imperfections, including craters, are documented on the unexposed interiors surfaces. The evident phase separation and nucleation sites suggest a need for better production controls and post-production annealing. DOE

**N83-23461#** Hanford Engineering Development Lab., Richland, Wash.
**THERMAL PROPERTIES OF LITHIUM CERAMICS FOR FUSION APPLICATIONS**
G. W. Hollenberg and D. E. Baker Mar. 1982 19 p refs Presented at the 84th Ann. Meeing of the American Ceramic Society, Cincinnati, 2-5 May 1982
(Contract DE-AC06-76FF-02170)
(DE82-016157; HEDL-SA-2674-FP; CONF-820547-14) Avail: NTIS HC A02/MF A01

Specific heat, thermal diffusivity and thermal conductivity were measured on Li2O, Li4SiO4, Li2ZrO3 and LiAlO2. Data on these properties are needed for design of an irradiation experiment to be performed on these materials. In general, the specific heat of a ceramic is primarily enrichment dependent, but the thermal diffusivity and thermal expansion coefficient may be influenced by microstructure. These measurements must be duplicated on the engineering materials finally selected for a particular design. DOE

**N83-23462#** Oak Ridge National Lab., Tenn. Metals and Ceramics Div.
**ELECTRONIC STRUCTURE OF METALLIC GLASSES**
P. Oelhafen, R. Lapka (Basel Univ.), U. Gubler (Gakushuin Univ.), J. Krieg (Paris-6 Univ.), A. DasGupta (Darmstadt Univ.), H. J. Guentherodt (Chicago Univ.), T. Mizoguchi, C. Hague, J. Kuebler, and S. R. Nagel 1981 7 p refs Presented at the 4th Intern. Conf. on Rapidly Quenched Metals, Sendai (Japan), 24-28 Aug. 1981 Sponsored in part by the Swiss National Science Foundation, the Kommission zur Foerderung der Wissenschaftlichen Forschung, the Eidgenoessische Stiftung zur Foerderung Schweizerischer Volkswirtschaft and the Fonds fuer Lehre und Forschung
(Contract W-7405-eng-26)
(DE82-020934; CONF-810851-5) Avail: NTIS HC A02/MF A01

The most important experimental results obtained from ultraviolet photoelectron spectroscopy, X-ray photoelectron spectroscopy, Auger electron spectroscopy and X-ray emission spectroscopy on a great variety of metallic glasses arae summarized. From this kind of measurement important information about the electronic

structure of both the valence band and core electrons can be obtained. DOE

**N83-23463#** National Timber Research Inst., Pretoria (South Africa).
**LONG-TERM WEATHERING TESTS ON GLULAM ASSEMBLED WITH WARM-SETTING WATTLE-BASED ADHESIVES**
F. A. Cameron Dec. 1981 15 p refs In ENGLISH; AFRIKAANS summary
(NTRI Proj. TP/43743)
(PB83-138586; CSIR/SR/HOUT-234; ISBN-0-7988-2320-8) Avail: NTIS HC A02/MF A01 CSCL 11L

Laminated beams bonded with three experimental warm setting adhesives and phenol/resorcinol/formaldehyde adhesive as control were tested after four years weather exposure. The results are presented. GRA

# 28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers; storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

**N83-23464*#** General Electric Co., Lynn, Mass. Aircraft Engine Business Group.
**ANALYTICAL FUEL PROPERTY EFFECTS, SMALL COMBUSTORS, PHASE 1 Final Report**
J. D. Cohen Apr. 1983 32 p
(Contract NAS3-22829)
(NASA-CR-168138; NAS 1.26:168138; R82AEB078) Avail: NTIS HC A03/MF A01 CSCL 21D

The effects of nonstandard aviation fuels on a typical small gas turbine combustor was analyzed. The T700/CT7 engine family was chosen as being representative of the class of aircraft power plants desired. Fuel properties, as specified by NASA, are characterized by low hydrogen content and high aromatics levels. Higher than normal smoke output and flame radiation intensity for the current T700 combustor which serves as a baseline were anticipated. It is, therefore, predicted that out of specification smoke visibility and higher than normal shell temperatures will exist when using NASA ERBS fuels with a consequence of severe reduction in cyclic life. Three new designs are proposed to compensate for the deficiencies expected with the existing design. They have emerged as the best of the eight originally proposed redesigns or combinations thereof. After the five choices that were originally made by NASA on the basis of competing performance factors, General Electric narrowed the field to the three proposed. Author

**N83-23465*#** SRI International Corp., Menlo Park, Calif.
**OXIDATION AND FORMATION OF DEPOSIT PRECURSORS IN HYDROCARBON FUELS Final Report**
Frank R. Mayo, Bosco Lan, David B. Cotts, S. E. Buttrill, Jr., and G. A. StJohn Mar. 1983 32 p refs
(Contract NAS3-22510)
(NASA-CR-168121; NAS 1.26:168121; SRI-2115) Avail: NTIS HC A03/MF A01 CSCL 21D

The oxidation of two jet turbine fuels and some pure hydrocarbons was studied at 130 C with and without the presence of small amounts of N-methyl pyrrole (NMP) or indene. Tendency to form solid-deposit precursors was studied by measuring soluble gum formation as well as dimer and trimer formation using field ionization mass spectrometry. Pure n-dodecane oxidized fastest and gave the smallest amount of procursors. An unstable fuel oil oxidized much slower but formed large amounts of precursors. Stable Jet A fuel oxidized slowest and gave little precursors. Indene either retarded or accelerated the oxidation of n-dodecane, depending on its concentration, but always caused more gum formation. The NMP greatly retarded n-dodecane oxidation but accelerated Jet A oxidation and greatly increased the latter's gum formation. In general, the additive reacted faster and formed most of the gum. Results are interpreted in terms of classical cooxidation theory. The effect of oxygen pressure on gum formation is also reported. Author

**N83-23466#** Douglas Aircraft Co., Inc., Long Beach, Calif.
**COMPATIBILITY STUDY OF ANTIMISTING KEROSENE AND THE DC/KC-10 FUEL SYSTEM Final Report, Mar. 1981 - Apr. 1982**
F. Y. Ching and A. T. Peacock Atlantic City FAA Mar. 1983 111 p refs
(Contract F33700-81-C-0057)
(FAA-CT-82-116) Avail: NTIS HC A06/MF A01

The compatibility of antimisting kerosene (AMK) with a contemporary fuel system was evaluated. AMK made with the FM-9 additive to the base fuel was used throughout the program. Tests were conducted to determine AMK effects on components and system performance, and component and system effects on the fuel. Some DC-10/KC-10 systems are incompatible with the AMK fuel. Systems and/or procedural revisions to accommodate the AMK do not appear to present technically insurmountable problems. AMK reduces the performance of some systems (e.g., jet pump transfer, gravity transfer, and suction feed) below normally accepted levels. Extensive study and testing will be required to certify the aircraft fuel system for use with the FM-9 AMK. Author

**N83-23467#** Materials Research Labs., Melbourne (Australia).
**POTASSIUM 4-HYDROXYAMINO-5,7-DINITRO-4, 5-DIHYDROBENZOFURAZANIDE 3-OXIDE, THE FIRST IN A SERIES OF NEW PRIMARY EXPLOSIVES**
William P. Norris and Robert J. Spear Feb. 1983 16 p refs
(MRL-R-870; AR-003-059) Avail: NTIS HC A02/MF A01

A structural analog of the primary explosive KDNBF, potassium 4-hydroxyamino-5,7-dinitro-4,5-dihydrobenzofurazanide 3-oxide, readily forms in nearly quantitative yield from reaction of 4,6-dinitrobenzofurazan 1-oxide with hydroxylamine in the presence of KHCO3/MeOH, and is isolated as free flowing nearly spherical crystals. The sensitivity of this compound to mechanical, electrostatic and thermal stimuli is typical of a primary explosive. Admixtures with lead azide are extremely sensitive to stab initiation. The compound thus shows excellent promise as a replacement for tetrazene in percussion and stab sensitive compositions. As a single increment, it ignites readily but power output is poor and 'sooty', i.e., oxygen deficient. Author

**N83-23468#** Toronto Univ. (Ontario). Inst. for Aerospace Studies.
**AN EXPERIMENTAL, ANALYTICAL AND NUMERICAL STUDY OF TEMPERATURES NEAR HEMISPHERICAL IMPLOSION FOCI**
T. Saito Dec. 1982 202 p refs Also sponsored by US Army Research Office and Canadian Natural Sciences and Engineering Research Council
(Grant AF-AFOSR-0096-82)
(UTIAS-260; ISSN-0082-5255) Avail: NTIS HC A10/MF A01

Spectroscopic temperature measurements in the visible radiation range were made near the focus of imploding shock waves in the UTIAS implosion chamber, which has a 20 cm diameter hemispherical cavity. The chamber was filled with a stoichiometric H2-O2 gas mixture at different initial pressures. The mixture was ignited at the origin by an exploding wire generating an outgoing detonation wave which reflected at the chamber wall as an imploding shock wave (gas runs). Additional experiments where an explosive shell of PETN was placed at the hemispherical wall were also conducted. The shell was detonated by the impact of the reflected gaseous detonation wave at its surface, thereby generating an intense implosion wave (explosive runs). The continuous spectra and the measured emissivities, which were close to unity, confirmed the blackbody nature of the gas near the implosion focus. Temperatures were determined by fitting the measured radiation intensity to Planck's radiation distribution curve. Author

**N83-23469#** Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Fuels and Lubrication Div.
**THE CHEMICAL AND PHYSICAL PROPERTIES OF JP-4 FOR 1980 - 1981 Final Technical Report, Jul. 1980 - Jun. 1981**
William E. Harrison, III Jun. 1982 163 p refs
(AF Proj. 3048)
(AD-A122965; AFWAL-TR-82-2052) Avail: NTIS HC A08/MF A01 CSCL 21/4

This report analyzes the chemical and physical properties of JP-4 purchased worldwide by the Defense Fuel Supply Center (DFSC) for the Air Force during the period July 1980 to June 1981. Data from 2122 Turbine Fuel Test reports were analyzed and summarized in the form of histograms. Summaries include historical trends, current data sorted into districts and states, and a worldwide summary. Author (GRA)

**N83-23470#** Department of Energy, Bartlesville, Okla. Energy Technology Center.
**FUELS/ENGINE INTERFACE RESEARCH: EDITED WORKSHOP PROCEEDINGS**
Dennis W. Brinkman, ed. Jul. 1982 99 p Workshop held in Bartlesville, Okla., 22-23 Sep. 1981
(DE82-015614; CONF-8109137) Avail: NTIS HC A05/MF A01

The research needs at the interface between the fuels and engines industries as new fuels and new engine systems emerge is considered. For individual titles, see N83-23471 through N83-23474.

**N83-23471#** Suntech, Inc., Marcus Hook, Pa.
**REFINING CURRENT FUELS FROM NEW RESOURCES**
Walter Douthit *In* DOE Fuels/Eng. Interface Res. Jul. 1982 p 21-27 (For primary document see N83-23470 13-28)
Avail: NTIS HC A05/MF A01

The development of essentially current specification liquid fuels from new resources, research needs in utilizing such fuels, and the research roles that might be played by industry, universities, and government are addressed. Author

**N83-23472#** Conoco Coal Development Co., Stamford, Conn.
**NEW FUEL TYPES**
Robert G. Jackson *In* DOE Fuels/Eng. Interface Res. Jul. 1982 p 28-35 (For primary document see N83-23470 13-28)
Avail: NTIS HC A05/MF A01

The state-of-the-art of the existing fuel/engine interface is addressed. Author

**N83-23473#** Deere and Co., Moline, Ill. Technical Center.
**IMPROVEMENT TO CURRENT ENGINES**
Norman A. Sauter *In* DOE Fuels/Eng. Interface Res. Jul. 1982 p 36-44 (For primary document see N83-23470 13-28)
Avail: NTIS HC A05/MF A01

Engine types, one class being diesel engines; the prechamber engine; the open chamber, the spark ignition engines; the reciprocating type; and the stratified charge engine are considered. Author

**N83-23474#** Cooper Energy Services, Springfield, Ohio.
**NEW ENGINE TECHNOLOGY** **c37**
Gerald L. Boner *In* DOE Fuels/Eng. Interface Res. Jul. 1982 p 44-51 (For primary document see N83-23470 13-28)
Avail: NTIS HC A05/MF A01

Engines of 5,000 horsepower or less per engine class were reviewed. The diesel, the Otto or spark ignited, gas turbine open cycle, gas turbine closed cycle, Stirling engine, steam Rankine cycle, organic Rankine cycle, stratified charge, and Wankel are discussed. Author

**N83-23475#** California Univ., Livermore. Lawrence Livermore Lab.
**CHEMICAL-KINETIC PREDICTION OF CRITICAL PARAMETERS IN GASEOUS DETONATIONS**
Charles K. Westbrook and Paul A. Urtiew 12 Jan. 1982 23 p refs Presented at the 19th Intern. Symp. on Combustion, Haifa, Israel, 8-13 Aug. 1982
(Contract W-7405-eng-48)
(DE82-007144; UCRL-87089; CONF-820801-3) Avail: NTIS HC A02/MF A01

A theoretical model including a chemical kinetic reaction mechanism for hydrogen and hydrocarbon oxidation is used to examine the effects of variations in initial pressure and temperature on the detonation properties of gaseous fuel-oxidizer mixtures. Fuels considered include hydrogen, methane, ethane, ethylene, and acetylene. Induction lengths are computed for initial pressures between 0.1 and 10.0 atmospheres and initial temperatures between 200 K and 500 K. These induction lengths are then compared with available experimental data for critical energy and critical tube diameter for initiation of spherical detonation, as well as detonation limits in linear tubes. Combined with earlier studies concerning variations in fuel-oxidizer equivalence ratio and degree of dilution with N2, the model provides a unified treatment of fuel oxidation kinetics in detonations. DOE

**N83-23476#** California Univ., Livermore. Lawrence Livermore Lab.
**THERMOCHEMICAL HYDROGEN PRODUCTION STUDIES AT LLNL**
Oscar H. Krikorian 8 Jun. 1982 7 p refs Presented at the Intern. Energy Agency Annex 1 Workshop on Thermochem. Hydrogen, San Diego, Calif., 22-24 Jun. 1982
(Contract W-7405-eng-48)
(DE82-016252; UCRL-87706; CONF-820646-1) Avail: NTIS HC A02/MF A01

Thermochemical hydrogen production based on magnetic fusion energy and solar central receivers as heat sources is studied. Some basic research is underway on the electrolysis of water from fused phosphate salts. DOE

**N83-23477#** Los Alamos Scientific Lab., N. Mex.
**HIGH-EXPLOSIVES TEST FACILITY**
Ernest C. Martinez and James H. Goforth Aug. 1982 20 p
(Contract W-7405-eng-36)
(DE82-021219; LA-9271-MS) Avail: NTIS HC A02/MF A01

A high explosives test facility that makes efficient use of equipment and combines utility, convenience and safety in a modest amount of space is described. It is a dedicated facility for exploratory development efforts that previously were conducted in a single room having very limited capabilities. Two explosives testing areas are available and several projects are supported concurrently. DOE

**N83-23478#** Department of Energy, Bartlesville, Okla. Energy Technology Center.
**AVIATION TURBINE FUELS, 1981**
Ella Mae Shelton Apr. 1982 14 p refs
(DE82-015870; DOE/BETC-PPS-82/2) Avail: NTIS HC A02/MF A01

Properties of some aviation turbine fuels marketed in the United States during 1981 are presented. The samples represented are typical 1981 production and were analyzed in the laboratories of 15 manufacturers of aviation turbine (jet) fuels. Results for the properties of 95 samples of aviation turbine fuels are included for military grades JP-4 and JP-5, and commercial type Jet A. Vapor pressure, acidity, moisture content, and thermal stability were among the properties measured. DOE

**N83-23479#** General Electric Co., Philadelphia, Pa. Reentry Systems Div.
**COAL DESULFURIZATION BY A MICROWAVE PROCESS: TECHNICAL PROCESS REPORT**
P. D. Zavitsanos, J. A. Golden, and K. W. Bleiler May 1982 23 p
(Contract DE-AC22-80PC-30142)
(DE82-016916; DOE/PC-30142/T4) Avail: NTIS HC A02/MF A01

Experiments were conducted to determine the effect of particle size and alkali concentration on the removal of sulfur and ash by microwave treatment of coal sampler mixed with sodium hydroxide,

which was added as a concentrated water solution. Sulfur and ash reductions were measured as a function of NaOH to coal ratios (0.15 to 4) as well as coal particle size in the mesh range 30 by 200 to 200 by 0. Although the data was not analyzed in any detail, it appears that very good cleaning can be accomplished with relatively low concentrations of NaOH (13% to 37%). The particle size variation results suggest that the most mineral matter was removed from the finest coal sample (200 x 0). This statement is based on the fact that the (200 x 0) feed sample was least beneficiated by the float sink step (22% ash vs 9 to 15% for more coarse samples). As for the sulfur reduction, it is difficult to distinguish significant differences between 200 x 0 and 30 x 0 mesh sizes. DOE

**N83-23480#** California Univ., Livermore. Lawrence Livermore Lab.
**DETONATION OF POROUS, HIGH-HMX, NITROGLYCERINE-CONTAINING PROPELLANT BY LOW-LEVEL SHOCK**
L. G. Green, E. S. Chambers, E. L. Lee, and B. Brown (Hercules, Inc.) 1982 9 p refs Presented at the 19th JANNAF Combustion Meeting, Greenbelt, Md., 4-7 Oct. 1982
(Contract W-7405-eng-48)
(DE82-021928; UCRL-87451-Rev-1; CONF-821030-1-Rev-1) Avail: NTIS HC A02/MF A01

Measurements of sympathetic detonation throw distances to impact damaged propellant are discussed. Reflected pressures at the threshold distances are about the same as pressures generated in piston compaction experiments on porous propellant at threshold piston velocities. Run distance to detonation experiments done on porous propellant using a steel impactor represent a final state from which run up to detonation occurs in both piston compaction experiments and in classical DDT experiments, which are seen as combustion driven mechanical compactions. DOE

**N83-23481#** Office of Technology Assessment, Washington, D.C.
**INCREASED AUTOMOBILE FUEL EFFICIENCY AND SYNTHETIC FUELS: ALTERNATIVES FOR REDUCING OIL IMPORTS**
Sep. 1982 297 p refs
(PB83-126094; OTA-E-185) Avail: NTIS HC A13/MF A01 CSCL 21D

Increased automobile fuel efficiency and synthetic fuels production are assessed and compared with respect to their potential to reduce conventional oil consumption, and their costs and impacts. Conservation and fuel switching as a means of reducing stationary oil uses are also considered, but in considerably less detail, in order to enable estimates of plausible oil imports. GRA

**N83-23482#** Texas A&M Univ., College Station. Center for Energy and Mineral Resources.
**BASIC RESEARCH OPPORTUNITIES FOR LASTING FUEL GAS SUPPLIES FROM INORGANIC RESOURCES**
Susan Adams, ed. and S. R. Baen 1 Oct. 1982 46 p Workshop held in College Station, Tex., 8 Jun. - 14 Aug. 1981 Sponsored in part by Gas Research Inst.
(PB83-126268; GRI-82/0020) Avail: NTIS HC A03/MF A01 CSCL 21D

The production of fuel gases from inorganic resources using indefinitely sustainable energy sources were reviewed. Photobiological, biomimetic, photochemical, photoelectrochemical, radiolytic and thermochemical pathways leading to the generation of hydrogen from water and hydrogen sulfide, of carbon monoxide and methane from carbon dioxide, and of nitrogen based fuel gases from atmospheric nitrogen were assessed. GRA

# 31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

**N83-23483*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
**THE GODDARD SPACE FLIGHT CENTER PREFERRED PARTS LIST, PPL-16**
Norman E. Tyson, ed. Jun. 1982 96 p refs
(NASA-TM-85291; NAS 1.15:85291) Avail: NTIS HC A05/MF A01 CSCL 13I

A listing is presented of preferred electronic parts, part upgrading procedures, part derating guidelines, and part screening procedures to be used in the selection, procurement, and application of parts for Goddard Space Flight Center space systems and ground support equipment. M.G.

**N83-23484#** Loher G.m.b.H., Ruhstorf/Rott (West Germany).
**COPPER SAVING IN THE PRODUCTION OF ROTATING ELECTRICAL MACHINES BY USING NEW ORGANOSILICON INSULATION MATERIALS Final Report, Jul. 1981**
Hans Kalias Bonn Bundesministerium fuer Forschung und Technologie Dec. 1982 45 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-218; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 10

New organosilicon sealing compounds were used to fill the cavities in the winding heads of rotating electrical machines. Organosilicon based overcoat materials were investigated. The result of the investigation showed that elastomer sealing compounds on the basis of the m polymers are suitable for this purpose, and that the insulation properties of the sealed complete windings and parts thereof can be optimized. Complete sealing of windings results in reduction of temperature rise. These sealing materials as well as the sealing process itself can be used for all electrical machines. Author

**N83-23485#** Riegger Diamantwerkzeuge G.m.b.H., Affalterbach (West Germany).
**DEVELOPMENT OF MANUFACTURING AND APPLICATION SYSTEM FOR CUTTING TOOLS MADE OF POLYCRYSTALLINE DIAMOND AND CUBIC BORON NITRIDE Final Report, Sep. 1981**
Guenther Werner Bonn Bundesministerium fuer Forschung und Technologie Dec. 1982 73 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-242; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 15,50

The improvement of the technology of making tools from ultrahard polycrystalline materials and to develop the pertinent conditions of application are discussed. High performance tools applying combined empirical/analytical methods. The following results are obtained: (1) development of high performance diamond grinding wheels and establishment of optimum machining conditions for making tools from polycrystalline material; (2) system development of standardized and spacial tools from polycrystalline cutting material; (3) investigation on wear and tool life of dressing tools made from polycrystalline diamond, and development of improved dressing tools. E.A.K.

**N83-23486#** SIGRI Electrogradhit G.m.b.H., Meitingen (West Germany). Bereich Zentrale Forschung.
**DEVELOPMENT OF SHAPED SIC ARTICLES WITH HIGH THERMAL STABILITY, MAINLY FOR USE IN GAS TURBINES Final Report, Dec. 1980**
Wolfgang Heider and Horst Boeder Bonn Bundesministerium fuer Forschung und Technologie Dec. 1982 44 p refs In GERMAN; ENGLISH summary Sponsoréd by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-244; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 9,50

The material properties of reaction bonded silicon carbide saturated with silicon (SiSiC) and the process technology for manufacturing complex, large size shaped articles of SiSiC were developed. Material properties showing the progress of development and established efficient parameters for the machining of ceramic materials were determined. We manufactured components for a full ceramic high temperature gas turbine which were then tested by turbine manufacturers in respect of operational performance under conditions resembling those in practical use. It is shown that the developed material is suitable for the manufacturing of turbine components subjected to static stresses. E.A.K.

**N83-23487#** United States Metric Board, Arlington, Va.
**SELECTED MAJOR STANDARDS DEVELOPMENT BODIES Interim Report**
John M. Tascher May 1982 73 p
(AD-A123096) Avail: NTIS HC A04/MF A01 CSCL 14/2

This interim report described the interviews the U.S. Metric Board staff conducted with the nine selected major standards developing bodies that historically have developed a predominant proportion of U.S. voluntary consensus standards, and details the findings from these interviews. The nine standards bodies were suggested by the American National Standards Institute and the American Society for Testing and Materials. The interviews were conducted in the period April 1981 through January 1982. GRA

**N83-23488#** Westinghouse Electric Corp., Trafford, Pa. Power Circuit Breaker Div.
**PROTOTYPE UHV COMPRESSED-GAS-INSULATED TRANSMISSION SYSTEM**
Feb. 1982 353 p refs
(Contract DE-AC01-76ET-29340)
(DE82-012287; DOE/ET-29340/3) Avail: NTIS HC A16/MF A01

Development, manufacture, testing and installation of a 1200 kV compressed gas insulated transmission line (CGIT) and an SF6-air bushing are reported. Gas insulation studies of SF6 and mixtures with nitrogen, air or carbon dioxide were conducted. Pure SF6 at .45 MPa (50 psig) was selected for use in the prototype. Various materials and construction alternatives for the enclosure and conductor were investigated. Aluminum was chosen for both the enclosure and conductor. These provide the 5000 A 75% load factor thermal rating under standard burial and grounding conditions. Effects of alternate burial, grounding and bonding conditions are reported. For the solid support insulators low dielectric constant materials and epoxy were studied. An arc resistant epoxy formulation was developed and used for both conical and Tripost insulators. A high performance plug in contact for conductor joints was developed. Two versions of an SF6-air bushing were built and tested. DOE

**N83-23489#** Los Alamos Scientific Lab., N. Mex.
**RESEARCH HIGHLIGHTS IN ENGINEERING SCIENCES, FISCAL YEAR 1982**
Apr. 1982 41 p Sponsored by DOE
(DE82-013802; LALP-82-14) Avail: NTIS HC A03/MF A01

The Engineering Sciences Directorate of the Los Alamos National Laboratory is responsible for developing and maintaining the engineering science resources needed to perform Laboratory programs and to establish expertise in new scientific, engineering, and technical areas of interest to the Laboratory. Highlights from several research efforts carried out in FY 1981 by the Engineering Sciences Divisions at Los Alamos are described. The diversity of these efforts illustrates the variety of research being conducted within the Directorate in support of programs and under the auspices of the Laboratory Director's supporting research and development program. Research on the following subjects is summarized: nuclear reactors; magnetic fusion; explosives; computing systems; electronics; and systems analysis. DOE

**N83-23490#** Oak Ridge Gaseous Diffusion Plant, Tenn.
**LARGE CLIMATE-MODERATING ENVELOPES FOR ENCLOSED STRUCTURES: A PRELIMINARY EVALUATION OF ENERGY-CONSERVATION POTENTIAL**
Garland E. Giles, James E. Park, and Robert L. Wendt 1982 24 p refs Presented at the ASME Winter Ann. Meeting, Phoenix, Ariz., 14-19 Nov. 1982
(Contract W-7405-eng-26)
(DE82-012817; K/CSD/INF-82-6; CONF-821101-1) Avail: NTIS HC A02/MF A01

A preliminary estimate is given of the energy conservation benefits of a large climate moderating envelope (LCME). A hypothetical LCME design was chosen and a coupled fluid dynamic and energy transport analysis was performed to estimate the energy conservation potential of this design. The heat transfer models included insolation, outside air temperature and wind, thermal radiation exchange with the sky, thermal radiation exchange between the fabric and ground, and thermal storage in the earth mass beneath the LCME. The energy transported within the fluid by the buoyancy driven circulation was modeled as an incompressible fluid utilizing the Boussinesq approximation. The climatic conditions were assumed to vary in smooth, repeating daily cycles. The numerical simulation of climatic variation was continued until the results within the LCME achieved a repeating daily cycle. The results for selected seasonally characteristic days were utilized to estimate the annual energy consumption of structures within an LCME relative to similar structures exposed to the exterior. DOE

**N83-23491#** Oak Ridge Gaseous Diffusion Plant, Tenn. Computer Sciences Dept.
**LARGE CLIMATE-MODERATING ENVELOPES FOR ENCLOSED STRUCTURES: A PRELIMINARY EVALUATION OF ENERGY-CONSERVATION POTENTIAL**
Garland E. Giles, James E. Park, and Robert L. Wendt Jun. 1982 9 p refs Presented at the ASME 1982 Winter Ann. Meeting, Phoenix, Ariz., 14-19 Nov. 1982 Submitted for publication
(Contract W-7405-eng-26)
(DE82-018350; K/CSD/INF-82/6-RI; CONF-821101-1-Rev-1) Avail: NTIS HC A02/MF A01

One method of reducing the energy consumption of one or more buildings is to isolate the buildings within a large envelope. The envelope moderates the effects of Sun, wind and precipitation and provides a more benign climate for habitation, commerce and, in some climates, agricultural activities. Results of a preliminary study of the qualitative energy conservation benefits are given for a large climate moderating envelope (LCME). The effects of weather, fluid circulation and radiant transport within the envelope and energy storage in the mass beneath the LCME are included. Based on model studies for selected days, the annual energy savings for summer dominated climates was estimated to be approximately 70%. The energy savings for a winter dominated climate LCME were estimated to be somewhat smaller, approximately 40%. DOE

**N83-23492#** California Univ., Livermore. Lawrence Livermore Lab.
**APPARATUS FOR LARGE-SCALE CABLE FIRE EXPERIMENTS**
Kirk J. Staggs 20 Jul. 1982 11 p
(Contract W-7405-eng-48)
(DE83-000659; UCID-19433) Avail: NTIS HC A02/MF A01

The design and fabrication of an apparatus for the performance of large-scale fire experiments on vertical cable arrays are described. On the basis of field surveys and previous experiments, the decision was made to use a vertical cable run with opposing horizontal runs at the top and bottom. To minimize interference with the burning process, and effort was made to keep the mass surrounding and supporting the cable specimens to a minimum. In order to accommodate these requirements and provide a means of measuring mass loss, a support apparatus had to be designed and fabricated. This apparatus was found to be a simple, reliable, and effective means of supporting the cables while minimizing the amount of mass surrounding them. DOE

**N83-23493#** California Univ., Livermore. Lawrence Livermore Lab.
**THE MECHANICS OF THE MACHINE-TOOL-WORKPIECE**

**SYSTEM**
Norman J. Brown 25 Oct. 1982 9 p refs Presented at the Optical Soc. of Am. Workshop on Optical Fabrication and Testing, Palo Alto, Calif., 14 Dec. 1982
(Contract W-7405-eng-48)
(DE83-001187; UCRL-88269; CONF-821208-5) Avail: NTIS HC A02/MF A01

A tutorial on lapping machine mechanics is presented. Summarization of what is known about conventional lapping machines with a minimum of mathematics is presented. While this deprives it to some extent of the latitude and concise precision of formulae, it can reach a wider audience and treat several topics that at present are formulated only with great difficulty. DOE

**N83-23494#** Kansas Dept. of Transportation, Topeka. Bureau of Materials and Research.
**ELECTRO-OSMOTIC TECHNIQUES FOR REMOVAL OF CHLORIDE FROM CONCRETE AND FOR EMPLACEMENT OF CONCRETE SEALANTS Final Report, Apr. 1976 - Aug. 1982**
G. P. Jayaprakash, John E. Bukovatz, K. Ramamurti, and William J. Gilliland Aug. 1982 66 p refs Sponsored in part by Federal Highway Administration
(PB83-124966; FHWA-KS-82-2) Avail: NTIS HC A04/MF A01 CSCL 13C

Chloride ion from bridge deck concrete can be removed by application of a direct current potential between bridge reinforcing steel (-) and a copper screen (+) conductor on the bridge surface. Soaring prices of all types of energy would make removal of all chloride prohibitatively expensive. The importance of verification of all electrical connections prior to the treatment is emphasized by the demonstration of concrete cracking when the steel was made a positive instead of a negative electrode. Data on effectiveness of calcium nitrite corrosion inhibitor added to the concrete overlay placed on electrotreated concrete is not extensive due to accidental damage to the test slabs. GRA

**N83-23495#** Centre Technique des Industries Mecaniques, Senlis (France).
**IONIC TREATMENT OF TOOLS AND GEARS**
A. Dubus, J. P. Peyre, M. Gantois, H. Michel, and C. Leroy Nov. 1982 226 p refs Transl. into ENGLISH of the book "Tritement Ionique des Outillages et Engrengages" France, Sep. 1980 262 p
(PB83-132241; CETIM-12-G-129) Avail: NTIS HC A11/MF A01 CSCL 13H

Ionic nitriding was studied. The diffusion layers were quantitatively and microstructurally analyzed. The fundamental mechanisms which govern the in situ transformation of sulfur carbides into nitrides and lead to the precipitation of cementite lattices are defined. Optimization of the treatment parameters allows for the realization of single phase layers on Z 155 CDV 12 steel. This phase transformation conditions the mechanical resistance of the nitrided layers. Wear test results indicate that for tool steels, the choice of nitriding treatment must be specific to the intended application. GRA

**N83-23496#** Centre Technique des Industries Mecaniques, Senlis (France).
**IMPROVEMENT OF AUTOMATIC CONTROL BY USE OF DATA PROCESSING. CASE OF ULTRASONIC CONTROL INTEGRATED IN THE MANUFACTURE OF HIGH-VALUE PIECES**
J. Rivenez Nov. 1982 26 p refs Transl. into ENGLISH of the book "Amelioration du Controle Automatique par l'Emploi d'un Traitement Informatique. Cas du Controle par Ultrasons Integre a la Fabrication des Pieces de Valeur" France, Dec. 1978
(PB83-138677) Avail: NTIS HC A03/MF A01 CSCL 13H

The possibilities and limitations of ultrasonic inspection are discussed and ways in which automatic data processing may be incorporated into control procedures are suggested. Ultrasonic fault detection is reviewed, including sorting and data analysis, all of which is often carried out manually. Advantages in automating this process are pointed out. A method whereby automatic ultrasonic fault detection can be integrated into the manufacture of parts on large forges is critically analyzed. Results are used to define a method of data acquisition and processing adapted to integrated fault detection during the fabrication of nonspecified valuable parts. It is noted that the equipment necessary for this implementation is not commercially available. GRA

# 32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

**N83-23497*#** TRW, Inc., Redondo Beach, Calif.
**REQUIREMENTS FOR A MOBILE COMMUNICATIONS SATELLITE SYSTEM. VOLUME 1: EXECUTIVE SUMMARY Final Report, 15 Dec. 1981 - 31 Mar. 1983**
11 Apr. 1983 50 p refs 2 Vol.
(Contract NAS3-23257)
(NASA-CR-168128; NAS 1.26:168128) Avail: NTIS HC A03/MF A01 CSCL 17B

Three types of satellite-aided mobile communications are considered for users in areas not served by (terrestrial) cellular radio systems. In System 1, mobile units are provided a direct satellite link to a gateway station, which serves as the interface to the terrestrial toll network. In System 2, a terrestrial radio link similar to those in cellular systems connects the mobile unit to a translator station; each translator relays the traffic from mobile units in its vicinity, via satellite, to the regional gateway. It is not feasible for System 2 to provide ubiquitous coverage. Therefore, System 3 is introduced, in which the small percentage of users not within range of a translator are provided a direct satellite link as in System 1. While System 2 can operate with leased satellite capacity, Systems 1 and 3 require a dedicated satellite. A major portion of this study is concerned with the design of a satellite for System 1. A weight limit of 10,000 lbs, corresponding to the projected 1990 STS capability, is imposed on the design. Frequency re-use of the allocated spectrum, through multiple satellite beams, is employed to generate the specified system capacity. Both offset-fed and center-fed reflectors are considered. For an assumed 10-MHz allocation and a population of 350,000 subscribers, a two-satellite system is required. The reflector diameters corresponding to offset-fed and center-fed geometries are 46 m and 62 m, respectively. Thus, large-space-structure technology is inherent to the implementation of System 1. In addition to establishing the technical requirements for the three types of satellite systems, the monthly service charge needed to provide a specified return on invested capital is computed. A net present value analysis is used for this purpose. Author

**N83-23498*#** TRW, Inc., Redondo Beach, Calif.
**REQUIREMENTS FOR A MOBILE COMMUNICATIONS SATELLITE SYSTEM. VOLUME 2: TECHNICAL REPORT Final Report, 15 Dec. 1981 - 31 Mar. 1983**
Michael Horstein 11 Apr. 1983 382 p refs 2 Vol.
(Contract NAS3-23257)
(NASA-CR-168129; NAS 1.26:168129) Avail: NTIS HC A17/MF A01 CSCL 17B

Three types of satellite aided mobile communications are considered for users in areas not served by (terrestrial) cellular radio systems. In system 1, mobile units are provided a direct satellite link to a gateway station, which serves as the interface to the terrestrial toll network. In system 2, a terrestrial radio link similar to those in cellular systems connects the mobile unit to a translator station; each translator relays the traffic from mobile units in its vicinity, via satellite, to the regional gateway. It is not feasible for system 2 to provide obiquitous coverage. Therefore, system 3 is introduced, in which the small percentage of users not within range of a translator are provided a direct satellite link as in system 1. Author

**N83-23499*#** Jet Propulsion Lab., California Inst. of Tech., Pasadena. Information Processing Research Group.
**INTRODUCTION TO THE CONCEPTS OF TELEDEMO AND TELEDIMS**
Robert F. Rice and Alan P. Schlutsmeyer 15 Dec. 1982 24 p refs
(NASA-CR-170294; NAS 1.26:170294; JPL-PUB-82-108) Avail: NTIS HC A02/MF A01 CSCL 17B

An introduction to the system concepts: TELEDEMO and TELEDIMS is provided. TELEDEMO is derived primarily from computer graphics and, via incorporation of sophisticated image data compression, enables effective low cost teleconferencing at data rates as low as 1K bit/second using dial-up phone lines. Combining TELEDEMO's powerful capabilities for the development of presentation material with microprocessor-based Information Management Systems (IMS) yields a truly all electronic IMS called TELEDIMS. S.L.

**N83-23500#** Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
**PROJECT OF LINEAR WIDEBAND MICROWAVE AMPLIFIERS WITH COMPLETE ASSISTANCE**
Claudemir Marcos daSilva Feb. 1983 63 p refs Presented at the 33rd Ann. Reunion of the SBPC, Salvador, Brazil, 8-15 Jul. 1981
(INPE-2655-PRE/268) Avail: NTIS HC A04/MF A01

The structure of a program for microwave circuit analysis (NETWORK), developed as an aid in the design of linear amplifiers is described. The potential of the program is shown by means of the step by step description of the design of a low noise amplifier for the 3.7 to 4.2 GHz band. S.L.

**N83-23501#** Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
**VERY LOW FREQUENCY PROPAGATION IN THE ANTARCTIC AND THE SOUTHERN ATLANTIC [PROPAGACAO DE V.L.F. NA ANTARTIDA E ATLANTICO SUL]**
A. T. Hadano, P. Kaufmann, V. L. R. Kuntz, L. Rizzo Piazza, and R. E. Schaal Jan. 1983 6 p In PORTUGUESE
(INPE-2630-PRE/257) Avail: NTIS HC A02/MF A01

Very low frequency wave propagation problems in the Antarctic and Southern Atlantic are discussed. Trans. by N.W.

**N83-23502*#** National Aeronautics and Space Administration, Washington, D. C.
**EXPLANATORY INFORMATION FOR NEWS CONFERENCE ON SATELLITE COMMUNICATIONS**
Feb. 1983 51 p Transl. into ENGLISH of presentation for Japanese press, Tokyo, Jun. 1982 39 p Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by Nippon Telegraph and Telephone Public Corp., Electric Communications Research Center, Tokyo
(Contract NASw-3541)
(NASA-TM-77199; NAS 1.15:77199) Avail: NTIS HC A04/MF A01 CSCL 17B

The CS-2 communications satellite which has features such as frequencies of the 30/20GHz band, demand assign time division multiple access, improved ship-to-satellite communications methods, and multibeam satellite communications methods. Research is continuing towards the production of larger, more economical communication systems via satellite which have greater efficiency and capacity. S.L.

**N83-23503#** Essex Univ., Colchester (England). Optical Communications Lab.
**A COMPARATIVE STUDY OF TEST SIGNALS FOR CORRELATIVE BACKSCATTER MEASUREMENTS ON OPTICAL FIBERS**
S. P. Woolhouse and J. J. OReilly May 1981 92 p refs
(Rept-168) Avail: NTIS HC A05/MF A01

A number of different binary test signals for use in correlative backscatter are compared. Two of these test signals (Golomb ruler codes and perfect difference sets) were not previously considered for correlative backscatter. The methods of finding suitable examples are outlined. The performance is considered for measuring attenuation characteristics and for locating faults in situations of peak and mean power limits in combination with either thermal or quantum noise. Under most conditions the Golomb ruler codes are the best choice of test signal in a correlative backscatter scheme. Author

**N83-23504#** Max-Planck-Institut fuer Radioastronomie, Bonn (West Germany).
**TEST MEASUREMENTS AT 9 MM WAVELENGTH FROM THE SECONDARY FOCUS**
W. J. Altenhoff, U. R. Buczilowski, D. A. Graham, and P. Matzik Nov. 1981 26 p refs
(TR-59) Avail: NTIS HC A03/MF A01

At wavelengths in the mm region the Effelsberg 100m - telescope allows mapping with resolution far less than an arcmin. The Faraday rotation becomes negligible and thus polarization and the underlying magnetic fields can be determined. Besides tests at 4 mm and 7 mm from the primary focus 9 mm waves were chosen to find out the smallest wavelength at which the 100 m dish can be effectively used. Therefore a one channel receiver for total power and polarization was developed. Four test measurements from the secondary focus were carried out. S.L.

**N83-23505#** Dornier-Werke G.m.b.H., Friedrichshafen (West Germany). Bereich Elektronik.
**ASSEMBLY FOR ONBOARD SAR DATA PROCESSING. PHASE 1: EXPERIMENTAL PRETESTING ALONG WITH DESIGN ACTIVITIES Final Report, Jul. 1980**
Roland Schotter and Berthold Eilebrecht Bonn Bundesministerium fuer Forschung und Technologie Dec. 1982 80 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-82-024; ISSN-0170-1339) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 17

The real time azimuth compression of the radar signals for onboard applications by means of a SAR processor requires a large amount of arithmetic operations which can only be performed with acceptable power consumption if low power LSI circuits are available. The analog correlator R 5403 of RETICON meets this condition. A 64 point complex correlator was implemented by means of this device. The real time tests were carried out successfully. One million, four hundred thousand image points per second are achieved at a clock rate of 2 MHz. The power consumption of a complete correlator covering a swath of 100 km was measured to be 100 Watt. The correlator was tested with a SAR simulator which supplied the raw radar data. S.L.

**N83-23506#** Ecole Nationale Superieure des Telecommunications, Paris (France). Dept. Systemes et Communications.
**VARIABLE RESOLUTION SPECTRUM ANALYSIS, APPLICATION TO SPEECH SIGNAL Ph.D. Thesis [ANALYSE SPECTRALE A RESOLUTION VARIABLE APPLICATION AU SIGNAL PAROLE]**
Christian Chouzenoux Nov. 1982 239 p refs In FRENCH
(ENST-E-82010) Avail: NTIS HC A11/MF A01

Coding by transformation, selective linear prediction, baseband vocoder, and coding by frequency bands are classic methods reviewed. Principles are presented for a proposed system for modeling frequency bands. Modeling resolution in each subband, synthesis by frequency band, and experimentation on the speech signal are described. Methods of analysis by spectral decomposition are critically examined. Spectral estimation of a limited band is considered with emphasis on the definition of a criteria for selective whiteness. Fourier analysis with variable resolution, modeling with variable resolution, and generalized autoregressive modeling are discussed. A.R.H.

**N83-23507#** Ecole Nationale Superieure des Telecommunications, Paris (France). Dept. Systems et Communications.
**STUDIES OF IDENTIFICATION ALGORITHMS FOR AUTOREGRESSIVE MODELS WHEN THE OBSERVATIONS ARE NOISY**

**Ph.D. Thesis [ETUDES D'ALGORITHMES D'IDENTIFICATION DE MODELES AUTOREGRESSIFS LORSQUE LES OBSERVATIONS SONT BRUITEES: APPLICATION]**
Kaleh Bry Nov. 1982 181 p refs In FRENCH
(ENST-E-82011) Avail: NTIS HC A09/MF A01

The effects of noise on an autoregressive signal are studied theoretically and approaches used to improve autoregressive parameter identification in the presence of noise are summarized. Identification methods which do not seem to have been used in this context are discussed including the subtraction of correlation in order to simultaneously estimate the noise and signal parameters, and the application of a principle for identifying a linear system for its free (transitory) response. Monte Carlo type identification experiments were conducted on synthetic autoregressive signals, with different signal to noise relationships. A series of curves shows the mean performances of the methods as a function of signal to noise relationship and as a function of other significant parameters. The performances were evaluated in speech analysis/synthesis.
Transl. by A.R.H.

**N83-23508#** Kiruna Geophysical Inst. (Sweden).
**EMISSION OF MYRIAMETRIC RADIATION BY COALESCENCE OF UPPER HYBRID WAVES WITH LOW FREQUENCY WAVES**
Kjell Roennmark Nov. 1982 25 p refs Submitted for publication
(KGI-Preprint-059; ISSN-0349-2656) Avail: NTIS HC A02/MF A01

Numerical analysis of the dispersion relations of waves, propagating perpendicular to the magnetic field in a plasma typical of the plasmapause region, shows that the resonance conditions for coalescence of upper hybrid waves with high harmonic ion Bernstein waves into electromagnetic radiation were satisfied. The power radiated by this process is calculated and predictions are made about the direction, polarization, and frequency spectrum of the emitted waves. Author

**N83-23509#** Uppsala Ionospheric Observatory (Sweden).
**OBSERVATIONS OF HF BACKSCATTER ASSOCIATED WITH THE HEATING EXPERIMENT AT TROMSOE**
Aake Hedberg, Harald Derblom, Bo Thide, Helmut Kopka, and Peter Stubbe 1982 26 p refs Presented at URSI Intern. Radio Symp., Fairbanks, Alaska, 9-13 Aug. 1982 Submitted for publication Sponsored by LSEET, Toulon, France, Swedish Research Inst. for National Defence, Deutsche Forschungsmeinschaft and Swedish Natural Science Research Council
(UIO-SR-82-02; ISSN-0349-2699) Avail: NTIS HC A03/MF A01

Backscatter echoes from a region modified by radio frequency (RF) heating above Tromso were observed. When the heater output is suddenly varied from "off" to "on" the backscatter echoes appear and grow to an equilibrium value in some seconds and decay at turn-off in some tens of seconds. Rise and decay time constants are frequency dependent, being longer at lower radar frequencies. The strongest echoes are obtained when the F-layer peak plasma frequency (foF2) is close to the heater pump frequency. Echoes are absent when the heater is operating in "x"-mode. Variation of heater output from 100% to 12.5% of full power yields a corresponding variation in the received echo amplitude without noticeable threshold effects. Some Doppler shift measurements are also presented indicating that the modified region, as well as the background has a radial motion towards north in the range 0 to 20 m/s. Author

**N83-23510#** Research Inst. of National Defence, Linkoeping (Sweden).
**MULTISPECTRAL TELEVISION**
Carl Hugo Aagren Nov. 1982 23 p Original contains color illustrations
(FOA-C-30283-E1) Avail: NTIS HC A02/MF A01

A video system for multispectral observation in real time which was built up using commercially available components is described. Various possibilities in realizing such a video system are described. Limitations in spectral sensitivity imposed by detector properties are discussed. Two illustrated applications are commented upon. Author

**N83-23511#** Essex Univ., Colchester (England). Optical Communications Lab.
**RECEIVERS FOR BINARY OPTICAL COMMUNICATIONS-OPTIMISATION UNDER THE CHERNOFF BOUND IN THE PRESENCE OF INTERSYMBOL INTERFERENCE**
J. R. F. DaRocha and J. J. OReilly May 1981 37 p refs
(Rept-167) Avail: NTIS HC A03/MF A01

A method for optical fiber receiver optimization based on a Chernoff bound and including intersymbol interference is presented. The description of relevant models is given, followed by a detailed mathematical characterization of both the detected optical power and colored Gaussian noise generated within the receiver. These mathematical tools are used to develop an expression for the Chernoff bound on the average error probability. The Chernoff bound is minimized using differential and variational methods; as a result a differential equation is obtained whose solution is the optimum filter. For the purpose of illustration this equation is applied to the specific case of Poisson signalling and a closed form solution is obtained. In the absence of intersymbol interference the result reduces to that obtained using a maximum likelihood criterion, so providing a partial check on the validity of the method. S.L.

**N83-23512#** Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
**RESEARCH ON NARROWBAND COMMUNICATIONS Final Report, 18 Aug. 1980 - 30 Nov. 1982**
Salim Roucos, Richard Schwartz, and John Makhoul Nov. 1982 96 p refs
(Contract F19628-80-C-0165; ARPA Order 3515)
(AD-A122838; BBN-5231) Avail: NTIS HC A05/MF A01 CSCL 17/2

This report describes the methods used to implement a very-low-rate (VLR) vocoder that transmits speech with a bit rate in the range of 100 to 200 b/s. The primary goal of this two-year project was for the vocoded speech to be intelligible in context, i.e., the vocoder can be used in a conversation. GRA

**N83-23513#** Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
**MULTIMODE GUIDANCE PROJECT LOW FREQUENCY ECM SIMULATOR: HARDWARE DESCRIPTION**
H. M. Kaye Oct. 1982 131 p refs
(Contract N00024-83-C-5301)
(AD-A122841; JHU/APL/TG-1335A) Avail: NTIS HC A07/MF A01 CSCL 09/2

The Multimode Guidance(MMG) Project, part of the Army/Navy Area Defense SAM Technology Prototyping Program, was established to conduct a feasibility demonstration of multimode guidance concepts. Prototype guidance units for advanced, long range missiles are being built and tested under MMG Project sponsorship. The Johns Hopkins University Applied Physics Laboratory has been designated as Government Agent for countermeasures for this project. In support of this effort, a family of computer-controlled ECM simulators is being developed for validation of contractor's multimode guidance prototype designs. The design of the Low Frequency ECM Simulator is documented in two volumes. This report, Volume A, describes the hardware design of the simulator; Volume B describes the software design. This computer-controlled simulator can simulate up to six surveillance frequency jammers in B through F bands and will be used to evaluate the performance of home-on-jamming guidance modes in multiple jammer environments. Author (GRA)

**N83-23514#** Naval Research Lab., Washington, D. C. Aerospace Systems Div.
**INVERSE SCATTERING THEORY AND ALMOST PERIODIC MEDIA Interim Report**
A. K. Jordan and D. L. Jaggard (Pennsylvania Univ., Philadelphia) 22 Dec. 1982 17 p refs
(RR0330242)
(AD-A122858; NRL-MR-4991) Avail: NTIS HC A02/MF A01

CSCL 20/14

We investigate several inverse methods to determine the dielectric profile of an almost periodic structure composed of several periodicities or tones. For widely spaced tones a resonance method provides the most useful solution while for closely spaced tones the Gelfand-Levitan-Marchenko theory appears to be the most promising. In this way these two methods complement each other so that a wide range of almost periodic media can be investigated. Criteria for characterizing resonant (widely spaced tones) and analytic (closely spaced tones) reflection coefficients are given and the appropriate inversion methods are demonstrated.

Author (GRA)

**N83-23515#** Utah Univ., Salt Lake City. Earth Science Lab.

**COMPUTER SIMULATION OF LOW-FREQUENCY ELECTRO-MAGNETIC DATA ACQUISITION**

William A. SanFilipo and Gerald W. Hohmann Feb. 1982 82 p refs

(Contract DE-AC07-79ID-12079)

(DE82-019925; DOE/ID-12079/46; ESL-62) Avail: NTIS HC A05/MF A01

Computer simulation of low frequency electromagnetic digital data acquisition in the presence of natural field noise demonstrates several important limitations and considerations. Without the use of a remote reference noise removal scheme it is difficult to obtain an adequate ratio of signal to noise below 0.1 Hz for frequency domain processing and below 0.3 Hz base frequency for time domain processing for a typical source-receiver configuration. A digital high-pass filter substantially facilitates rejection of natural field noise above these frequencies but, at lower frequencies where much longer stacking times are required, it becomes ineffective. Use of a remote reference to subtract natural field noise extends these low-frequency limits a decade, but this technique is limited by the resolution and dynamic range of the instrumentation. Gathering data in short segments so that natural field drift can be offset for each segment allows a higher gain setting to minimize dynamic range problems. DOE

**N83-23516#** Texas A&M Univ., College Station.

**FIELD DEMONSTRATIONS OF COMMUNICATION SYSTEMS FOR DISTRIBUTION AUTOMATION**

V. T. Rhyne Jun. 1982 101 p

(DE82-020113; DOE/NBB-0012) Avail: NTIS HC A06/MF A01

Communication systems for distribution automation and load management were developed. This program included three power line carrier projects, an ultra high frequency radio project, and a telephone project. For each project, a two way (half duplex) digital communication system was developed to perform such functions as fault location and isolation, distribution feeder switching, load control, time of day metering, remote meter reading, and equipment monitoring. Most of these demonstration projects were subject to hardware failures and schedule slippages, but when the data pertinent to the two way communications performance of the operational portions of each system were examined, performance at or above an 80% success rate was measured in all projects. These results support the conclusion that each of these communications systems can satisfy utility requirements for distribution automation, load control and remote meter reading. DOE

**N83-23517#** Los Alamos Scientific Lab., N. Mex.

**BREAKDOWN CRITERIA DUE TO RADIO-FREQUENCY FIELDS IN VACUUM Final Report**

Don W. Reid and Richard A. Lohsen 1982 7 p refs Presented at the 10th Intern. Symp. on Discharges and Elec. Insulation in Vacuum, Columbia, S.C., 25-28 Oct., 1982

(Contract W-7405-eng-36)

(DE82-021883; LA-UR-82-2400; CONF-821024-3) Avail: NTIS HC A02/MF A01

The factors that affect the voltage at which vacuum gaps break down are analyzed. Based on the literature and some simplifying assumptions, a functional dependence is hypothesized. The hypothesis is related to a proposed experiment using radio-frequency power to generate the breakdown voltage. DOE

**N83-23518#** Oak Ridge National Lab., Tenn. Health and Safety Research Div.

**SCATTERING OF A PLANE ELECTRO-MAGNETIC WAVE BY A CONDUCTING CIRCULAR CYLINDER Ph.D. Thesis - Tennessee Univ., Knoxville**

Youe-Tsyr Chu Oct. 1982 158 p refs

(Contract W-7405-eng-26)

(DE83-001682; ORNL/TM-8451) Avail: NTIS HC A08/MF A01

The uniform asymptotic solution of light scattering from a conducting circular cylinder at oblique incidence is derived by using the Watson transformation method. It is demonstrated that the major contributions of the total field are the Fresnel integrals in the transition regions, the creeping waves in the shadow region, and the incident wave and the reflected wave in the lighted region. The creeping wave is excited by the incident ray tangential to the surface of the cylinder, and it creeps further into the shadow region. The positions of intensity maxima and minima of the scattered light predicted by the uniform asymptotic solution were in good agreement with experiment. Although the uniform asymptotic solution is derived under the assumptions of high frequency and large radius, it still gives good results at relatively low frequencies, where the ratio of the radius to the wavelength is of the order unity. The uniform asymptotic solution has the advantages of simplifying the numerical calculation and of giving a physical model of the exact solution. DOE

**N83-23519#** California Univ., Berkeley. Lawrence Berkeley Lab. Earth Sciences Div.

**DEEP ELECTROMAGNETIC SOUNDING IN CENTRAL NEVADA**

M. Wilt, N. E. Goldstein, J. R. Haught, and H. F. Morrison Apr. 1982 7 p refs Presented at the SEG 1982 Ann. Meeting, Dallas, 17-21 Oct. 1982

(Contract DE-AC03-76SF-00098)

(DE82-020065; LBL-14319; CONF-821025-1) Avail: NTIS HC A02/MF A01

Sixteen shallow and deep controlled source electromagnetic soundings were performed in Buena Vista Valley, near Winnemucca, Nevada, to investigate an intra-basement conductor previously detected with magnetotellurics. The survey was carried out with the LBL EM-60 system using a remote magnetic reference for low-frequency geomagnetic noise cancellation, 100-m and 2.8-km-diameter transmitter loops, and a minicomputer for in-field processing. EM soundings were made at distance from 0.5 to 30 km from three loops over the frequency range 0.02 to 500 Hz. Data were interpreted by means of 1-D inversions and the resulting layered models were pieced together to yield an approximate 2-D geoelectric model along the N-S axis of the valley. The EM soundings and one MT sounding show a 3 to 7 ohm-m zone at a depth of four to seven km. The conductor appears to be deepest at the northern end. DOE

# 33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics.*

**N83-23520#** Aerospace Corp., El Segundo, Calif. Chemistry and Physics Lab.

**THE STRUCTURE OF ELECTROLYTE FILMS ON BATTERY SEPARATORS AND ELECTRODES**

H. F. Bittner, C. C. Badcock, R. L. Brittain, T. Fitzmaurice, and E. Shon 19 Apr. 1982 39 p refs

(AC-ATR-81(8426)-1) Avail: NTIS HC A03/MF A01

Structural properties of alkaline electrolyte films on battery electrode and separator materials are investigated. Thermodynamic principles that affect film formation are presented, and a model is developed that predicts the wetting-dewetting transition, for a

network of fibers, as a function of electrolyte volume and fiber network compactness. Film characteristics on single fibers and networks of fibers of a variety of materials are studied by a laser diffraction technique and by conductivity measurements. Materials studied include nickel, cadmium, nylon, polypropylene, and Teflon. Wetting characteristics of actual separator materials are studied in a simulated battery environment. Experimental results yield good agreement with the model. Author

**N83-23521#** Siemens A.G., Munich (West Germany). Forschungslab.

**DEVELOPMENT METHODS FOR VLSI-PROCESSORS Final Report, Apr. 1981**

Gerd Sandweg, Karlheinrich Horninger, Ulrich Theus (Tech. Hochschule, Aachen), and Ulrich Ludemann (Tech. Univ., Hannover) Bonn Bundesministerium fuer Forschung und Technologie Dec. 1982 71 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-219; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 15

A modern system and circuit concepts for VLSI-processors with a 32 bit wide data path was developed. The general purpose processor is not only logically but also physically divided into four functional units: a microprogrammable instruction unit, an execution unit in slice technique, a fully associative cache memory and an I/O unit. The ALU of the execution unit circuits in PLA and slice techniques are realized. The slice technique is preferred for regularity, area consumption and achievable performance. The designs utilize selftesting circuitry. E.A.K.

**N83-23522#** Siemens A.G., Munich (West Germany). Werk fuer Integriete Schaltungen.

**DEVELOPMENT OF A TWO MICRO MOS PROCESS LINE FOR FABRICATION OF VLSI PRODUCTS Final Report, Dec. 1980**

Karlheinz Horninger, Winfried Ruettenauer, and Heinrich Schulte Bonn Bundesministerium fuer Forschung und Technologie Dec. 1982 72 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-220; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 15

The development of a Si-Gate-process for fabrication of VLSI-products with minimum linewidth down to 2 microns is described. In a pilot-process-line dedicated to this task modern equipment for line definition and film deposition is installed. As test-vehicles for the evaluation of the processline dynamic memories (16 k bit) and microprocessor-circuits (8085) are successfully employed. Author

**N83-23523#** Societe Nationale Industrielle Aerospatiale, Les Mureaux (France).

**REPLACEMENT OF ELECTROMECHANICAL DEVICES BY CATHODE RAY TUBES**

J. P. Laborie and J. Langlet (Thomson-CSF) 1982 35 p refs
(SNIAS-822-111-110) Avail: NTIS HC A03/MF A01

The use of cathode ray tubes for civil or military aircraft is discussed. The basic technology is described including multichromatic phosphors. Specific features used for aeronautical application include: high brightness, high tolerance to temperature and vibration, resistance to rapid depressurization of the aircraft, and protection against electromagnetic interference. S.L.

**N83-23524#** RCA Solid State Div., Somerville, N.J.

**HIGH-RELIABILITY, LOW-COST INTEGRATED CIRCUITS, PHASE 3 Final Report**

1982 93 p
(Contract N00039-76-C-0240; XF54586002)
(AD-A123115) Avail: NTIS HC A05/MF A01 CSCL 09/5

The objective of Phase 3 of this investigation was to demonstrate the reliability of the integrated circuits fabricated in Phase 2 according to the processes developed in Phase 1 (see Phase 1 and Phase 2 Final Development Reports for High-Reliability, Low-Cost Integrated Circuits, Contract No. N00039-76-C-0240). Devices were evaluated on the basis of a variety of life and environmental tests and the data recorded on magnetic tape for later retrieval and analysis. Computer software programs were developed to allow the data to be presented in a number of ways for evaluation and to allow the calculation of failure rates.
Author (GRA)

**N83-23525#** California Univ., Davis. Signal and Image Processing Lab.

**INFLUENCES OF HARDWARE IMPLEMENTATION ON A HIGH SPEED DIGITAL ADAPTIVE FILTER USING THE RESIDUE NUMBER SYSTEM**

Kimberly D. Weinmann Apr. 1982 102 p refs
(Grant AF-AFOSR-0189-80; AF Proj. 2304)
(AD-A123146; SIPL-82-4; AFOSR-82-1085TR) Avail: NTIS HC A06/MF A01 CSCL 09/1

A study of the performance and certain characteristics of an eight-weight adaptive FIR digital filter implementing the LMS algorithm using Residue Number System (SRNS) arithmetic hardware has been done in order to draw conclusions as to the optimum hardware configuration. Affects of the hardware and unknown system on the rate of convergence and adaptive algorithm step size were found by running filter simulations for different values of the systems quantities. It was found that characteristics of the unknown system (or plant) do not affect the choice of filter hardware. Author (GRA)

**N83-23526#** Hughes Aircraft Co., El Segundo, Calif.

**ADVANCED CAPACITORS**

Robert D. Parker, Robert S. Buritz, A. R. Taylor, and E. P. Bullwinkel Wright-Patterson AFB, Ohio AFWAL Nov. 1982 95 p refs
(Contract F33615-79-C-2081; AF Proj. 3145)
(AD-A122961; AFWAL-TR-82-2098; FR-82-76-799A) Avail: NTIS HC A05/MF A01 CSCL 20/3

An experimental development program was conducted to develop and test advanced dielectric materials for capacitors for airborne power systems. High rep rate and low rate capacitors for use in pulse-forming networks, high voltage filter capacitors, and high frequency ac capacitors for series resonant inverters were considered. The initial goal was to develop an improved polysulfone film. Initially, low breakdown strength was thought to be related to inclusions of conductive particles. The effect of filtration of the casting solution was investigated. These experiments showed that more filtration was not the entire solution to low breakdown. The film samples were found to contain dissolved ionic impurities that move through the dielectric when voltage is applied and cause enhancement of the dielectric field. These contaminants enter the film via the resin and solvent, and can be partially removed. However, these treatments did not significantly improve the breakdown characteristics. A new material, Ultem, was proposed for use in high energy density capacitors. This new polyetherimide resin has properties similar to polysulfone and polyimide, with improvement in breakdown characteristics and temperature capability. The technique of casting films on a roughened drum was demonstrated, and found useful in preparing textured films. this is the first step toward a replacement for kraft paper. GRA

**N83-23527#** Naval Research Lab., Washington, D. C.

**AN ASSESSMENT OF GRAPHITIZED CARBON FIBER USE FOR ELECTRICAL POWER TRANSMISSION Final Report**

J. S. Murday, D. D. Dominguez, J. A. Moran, Jr., W. D. Lee, and R. Eaton 7 Jan. 1983 53 p refs
(Contract ET-78-I-01-2897)
(AD-A122919; NRL-MR-4993) Avail: NTIS HC A04/MF A01 CSCL 20/3

Significant progress has been made in the last several years toward the production of highly conductive carbon filament. Graphitized carbon fibers, made from a variety of precursor materials such as PAN, pitch and benzene, have electrical conductivity in the range 10 to the -6 power -10 to the -7 omega m, tensile strength in the range 1-3 GPa, tensile modulus in the range 100-700 GPa and density in the range 1.8 -2.2 x 10 to the

3rd power kg/m cube. These properties suggest graphitized fibers may have potential as current carrying material for electrical power transmission. This paper reviews the physical reasons for the electrical and mechanical properties and evaluate prospects for better conductivity without degradation of mechanical properties. Chemical doping (intercalation) is found capable of achieving X5-15 improvements in conductivity with some degradation in tensile strength. Various applications for electrical power transmission usage are examined, i.e., underground and overhead conduction, underground pipe, overhead towers and submarine cable. Near term usage is most probable in towers and submarine cable where high strength to weight advantages may offset the good, but not great, fiber electrical conductivity. Author (GRA)

**N83-23528#** Michigan Univ., Ann Arbor. Electron Physics Lab.
**COMPUTER MODELING OF MILLIMETER-WAVE IMPATT DIODES. ONE OF A SERIES OF REPORTS ON MILLIMETER-WAVE CIRCUIT ANALYSIS AND SYNTHESIS Interim Report, May 1981 - May 1982**
Robert K. Froelich Wright-Patterson AFB, Ohio AFWAL Nov. 1982 164 p refs
(Contract F33615-81-K-1429; AF Proj. 2002)
(AD-A122901; TR-158; AFWAL-TR-82-1107) Avail: NTIS HC A08/MF A01 CSCL 09/2

A model of millimeter-wave Si IMPATTs has been developed which includes transient transport effects neglected in the conventional drift-diffusion model. The new model is based on principles of energy and momentum conservation. The model uses the first three velocity moments of the phase-space transport equation. Terms accounting for the effects of collisions incorporate energy dependent relaxation times and ionization rates. GRA

**N83-23529#** Argonne National Lab., Ill. Components Technology Div.
**CROSSFLOW FORCE TRANSDUCER**
T. M. Mulcahy May 1982 56 p refs
(Contract W-31-109-eng-38)
(DE82-021141; ANL-CT-82-11) Avail: NTIS HC A04/MF A01

A force transducer for measuring lift and drag coefficients for a circular cylinder in turbulent water flow is presented. In addition to describing the actual design and construction of the strain gauged force ring based transducer, requirements for obtained valid fluid force test data are discussed, and pertinent flow test experience is related. DOE

**N83-23530#** Lincoln Lab., Mass. Inst. of Tech., Lexington.
**EVALUATION OF RECENT RESIDENTIAL INVERTERS**
B. E. Nichols Jun. 1982 23 p refs
(Contract DE-AC02-76ET-20279)
(DE82-022237; DOE/ET-20279/205) Avail: NTIS HC A02/MF A01

Seven residential utility interactive inverters for photovoltaic power systems were evaluated. Five inverters: an 8 kW (dc) model with an ac filter to improve the output current waveform and power factor; a 10 kW (ac) model, a 6 kW (dc) model; and 2 kW and 4 kW (ac) models were reviewed. Input and output power, power factor, current waveform distortion, audio noise and radio frequency interference measurements were made and the results are presented. DOE

**N83-23531#** GK Technologies, Inc., Edison, N.Y.
**DEVELOPMENT OF EXTRUDED DIELECTRIC UNDERGROUND TRANSMISSION CABLES RATED 138 kV, 230 kV AND 345 kV, VOLUME 2 Final Report**
G. Bahder, L. A. Bopp, G. S. Eager, C. Katz, A. Knott, and G. A. Schmidt Feb. 1982 228 p Sponsored by EPRI
(Contracts DE-AC01-76ET-29311; E(49-18)-1827; EPRI Proj. 7829-1)
(DE82-008309; EPRI-EL-428-Vol-2) Avail: NTIS HC A11/MF A01

Technology to manufacture chemically crosslinked polyethylene insulated power cables in the ac voltage range of 138 kV to 345 kV having insulation thicknesses approximately equal to that of oil impregnated paper insulated cables is developed. The development of field molded splices and terminations for high voltage stress 138 kV cables are also incorporated. After reviewing the main equipment elements, incorporated in the pilot extrusion line, the special features of this system are noted and a step by step description of the cable extrusion process is given. Optimization of the process and introduction of modifications in the equipment culminated with the production of 138 kV cables. Results of laboratory tests to demonstrate the high quality of the cables are given. The development of molded splices and molded stress control cones was initiated with the work on model cables and followed by the making of splices and terminations on 138 kV cables. DOE

**N83-23532#** EHV-Weidmann Industries, Inc., St. Johnsbury, Vt.
**ADVANCED CONCEPTS FOR TRANSFORMERS PRESSBOARD DIELECTRIC CONSTANT AND MECHANICAL STRENGTH**
Mar. 1982 279 p refs Prepared in cooperation with Weidmann (H.) Ltd.
(Contract DE-AC01-78ET-29307)
(DE82-015477; DOE/ET-29307/1) Avail: NTIS HC A13/MF A01

Of the numerous electrical considerations in a material, the value of the dielectric constant serves as an important criterion in designing proper insulation systems. Ways to reduce the dielectric constant of solid (fibrous) insulating materials were investigated. A literature search was made on cellulosic and synthetic fibers and also additives which offered the potential for dielectric constant reduction of the solid insulation. Sample board structures were produced in the laboratory and tested for electrical, mechanical and chemical characteristics. Electrical tests determined the suitability of the material at transformer test and operating conditions. The mechanical tests established the physical characteristics of the modified board structures. Chemical tests checked the conductivity of the aqueous extract, acidity, and ash content. Further, compatibility with transformer oil and some aging tests were performed. An actual computer transformer design was made based on one of the modified board structures and the reduction in core steel and transformer losses were shown. DOE

**N83-23533#** Battelle Columbus Labs., Ohio.
**FIELD EXPERIENCES WITH MULTIFREQUENCY-MULTIPARAMETER EDDY-CURRENT TECHNOLOGY Final Report**
S. Brown Mar. 1982 133 p refs
(EPRI Proj. S115-1)
(DE82-903311; EPRI-NP-2299) Avail: NTIS HC A07/MF A01

A multifrequency/multiparameter eddy current system was assembled for the inservice inspection of pressurized water reactor steam generator tubing. Five steam generators were inspected for a total data base of approximately 11,000 tubes. Based on a comparison with conventional single frequency inspection methods, multifrequency/multiparameter eddy current technology offers significant improvements. Multifrequency eddy current, with its multiple frequency coil excitation, can offer benefits in reducing in containment data acquisition time by the performance of parallel tube tests; in addition the resulting broad spectrum data base is useful for the analysis of complex or nonunique signals which can arise during a steam generator inspection. Multiparameter eddy current offers an approach for the real time suppression of extraneous variables such as support plates/tube sheet, ID noise and denting. With appropriate mixing/basis frequency combinations, tube degradation in the presence of the extraneous variables can be more reliably detected and characterized. DOE

**N83-23534#** Bendix Corp., Kansas City, Mo.
**ADVANCED PROGRAMMER MANUFACTURING Final Report**
J. M. Emmons and D. J. Caruthers Aug. 1982 67 p ref
(Contract DE-AC04-76DP-00613)
(DE82-021308; BDX-613-2805) Avail: NTIS HC A04/MF A01

Point-to-point wiring in electronic packages was reduced by redesigning the package and using multilayer printed wiring boards. Processes to provide a leak rate of less than 1 x 10 to the -6 power cu cm/s were determined, but a low moisture content of

20 parts per million over the assembly life could not be achieved. Several materials were considered for use as a conformal coating, from which a two-component urethane which could be applied in multiple thin coats was chosen. A three-cycle (dip, spin, and oven-cure) process was developed for application of the material. Raised lands were evaluated, and recommendations to reduce their occurrence are given. DOE

**N83-23535#** Los Alamos Scientific Lab., N. Mex.
**SUPERCONDUCTING MAGNETIC ENERGY STORAGE FOR BPA TRANSMISSION-LINE STABILIZATION**
J. D. Rogers, M. H. Barron, H. J. Boenig, A. L. Criscuolo, J. W. Dean, and R. I. Schermer 1982 4 p refs Presented at the Appl. Superconductivity Conf., Knoxville, Tenn., 30 Nov. - 3 Dec. 1982
(Contract W-7405-eng-36)
(DE83-000640; LA-UR-82-2719; CONF-821108-3) Avail: NTIS HC A02/MF A01

The Bonneville Power Administration (BPA) operates the electrical transmission system that joints the Pacific Northwest with southern California. A 30 MJ (8.4 kWh) Superconducting Magnetic Energy Storage (SMES) unit with a 10 MW converter is being installed at the Tacoma Substation to provide system damping for low frequency oscillations of 0.35 Hz. The integrated system status is described and reviewed. Components included in the system are the superconducting coil, seismically mounted in an epoxy fiberglass nonconducting dewar; a helium refrigerator; a heat rejection subsystem; a high pressure gas recovery subsystem; a liquid nitrogen trailer; the converter with power transformers and switchgear; and a computer system for remote microwave link operation of the SMES unit. DOE

**N83-23536#** Los Alamos Scientific Lab., N. Mex.
**SUPERCONDUCTING FAULT-CURRENT LIMITER AND INDUCTOR DESIGN**
J. D. Rogers, H. J. Boenig, P. Chowdhuri, R. I. Schermer, J. J. Wollan, and D. M. Weldon 1982 6 p refs Presented at the Appl. Superconductivity Conf., Knoxville, Tenn., 30 Nov. - 3 Dec. 1982
(Contract W-7405-eng-36)
(DE83-000641; LA-UR-82-2720; CONF-821108-2) Avail: NTIS HC A02/MF A01

A superconducting fault current limiter (SFCL) that uses a biased superconducting inductor in a diode or thyristor bridge circuit was analyzed for transmission systems in 69, 138, and 230 rms kV utility transmission systems. The limiter was evaluated for costs with all components, superconducting coil, diode and/or SCR power electronics, high voltage insulation, high voltage bushings and vapor cooled leads, dewar, and refrigerator, included. A design was undertaken for the superconducting cable and coils for both diode and SCR 69 kV limiter circuits. DOE

**N83-23537#** Sandia Labs., Albuquerque, N. Mex.
**PLASMA-EDGE STUDIES USING CARBON RESISTANCE PROBES**
W. R. Wampler and D. M. Manos (Princeton Univ.) 1982 16 p refs Presented at the 29th Natl. Symp. of the Am. Vacuum Soc., Baltimore, 16 Nov. 1982
(Contract DE-AC04-76DP-00789)
(DE82-022191; SAND-82-2016C; CONF-821111-7) Avail: NTIS HC A02/MF A01

The plasma edge in the PLT and PDX Tokamaks was studied using a technique which involves measuring the change in resistance of a thin carbon film due to bombardment by energetic particles escaping the plasma. The probes were calibrated by measuring the resistance change caused by implantation of various ions at different energies. A model was developed which can be used to determine the flux and energy of the incident particles from the measured resistance changes. For probes exposed in PDX and PLT, near the wall resistance changes were observed due to charge exchange neutrals. Larger changes were observed in the ion scrape-off region closer to the plasma. In PLT the effect of ions at the plasma edge begins to dominate the neutral flux near the radius of the ring limiter. The energy of ions at the plasma edge was estimated to be low ($<$ or 100 eV) in PDX during neutral beam heated discharges, but higher ($>$ 300 eV) in PLT during ion cyclotron resonance heating. DOE

**N83-23538#** National Bureau of Standards, Washington, D.C. Center for Electronics and Electrical Engineering.
**MEASUREMENT OF ELECTRICAL QUANTITIES IN PULSE-POWER SYSTEMS Final Report**
R. H. McKnight, ed. and R. E. Hebner, Jr., ed. Jun. 1982 412 p refs Presented at the Workshop on Measurement of Elec. Quantities in Pulse Power Systems, Boulder, Colo., 2-4 Mar. 1981
(Contract DE-AI08-81DP-40148)
(DE82-021322; DOE/DP-40148/1; CONF-810325; NBS-SP-628) Avail: NTIS HC A18/MF A01

Measurements in pulse systems having the characteristics of pulse duration less than a millisecond, system voltages greater than 10 kilovolts, and system currents greater than 10 kiloamperes were addressed. Areas addressed included: voltage measurements, current measurements, power and energy measurements, data acquisition, applications of conventional measurement techniques and state of the art systems. DOE

**N83-23539#** Sandia Labs., Albuquerque, N. Mex.
**EVALUATION OF AL SUB X Ga SUB 1-X As FOR HIGH TEMPERATURE ELECTRONIC-JUNCTION-DEVICE APPLICATIONS**
T. E. Zipperian, L. R. Dawson, and C. E. Barnes 1982 16 p refs Presented at the Intern. Symp. on GaAs and Related Compounds, Albuquerque, N. Mex., 20 Sep. 1982
(Contract DE-AC04-76DP-00789)
(DE82-022164; SAND-82-1323C; CONF-820960-1) Avail: NTIS HC A02/MF A01

Mesa isolated, p(+)nn(+) GaAs/Al/sub X/Ga/sub 1-x/As/GaAs ($0.10 < x < 0.5$), double heterojunction diodes are examined over the full temperature range from 50 to 400 C. Al/sub x/Ga/sub 1-x/ As is selectively used to suppress reverse junction leakage. GaAs is used for heterojunction contacts and as an encapsulant for the chemically reactive Al/sub x/Ga/sub 1-x/As. An AlAs concentration of approximately 30% was found to provide significant improvements in the high temperature reverse leakage (compared to GaAs homojunctions) without the necessity of going to higher values of x. Extending the diode work to three terminal devices, a heterojunction collector bipolar junction transistor was fabricated. These results demonstrate that Al/sub x/Ga/sub 1-x/As coupled with GaAs for contacting and encapsulation is a good materials system for high temperature junction device applications. DOE

**N83-23540#** Brookhaven National Lab., Upton, N. Y.
**HIGH POWER, TRIPLE GRID THYRATRON AND ITS TEST CIRCUIT**
H. Menown (English Electric Valve Co. Ltd, Chelmsford), B. Newton (English Electric Valve Co. Ltd., Chelmsford), and R. F. Lambiase 1982 4 p ref Presented at the 15th Power modulator Symp., Baltimore, 14-16 Jun. 1982
(Contract DE-AC02-76CH-00016)
(DE83-000212; BNL-31848; CONF-820626-11) Avail: NTIS HC A02/MF A01

As part of the polarized proton experiment on the AGS at Brookhaven National Laboratory, a requirement has arisen for a special thyratron device to switch the pulsed quadrupole magnets. The magnet drive-current waveform consists of a series of triangular pulses of alternate polarity, with amplitude increasing from 400A in the first pulse, to 2.7kA in the last pulse. Pulse rise-time is 2 microns with a linear fall to a base line of about 3ms. Over 3.5 Coulombs are switched in the largest pulse. The pulse series is repeated every 2.5 seconds leading to an average switch current approaching 4A. EEV has designed a special thyratron to switch this circuit, and built a suitable test station. DOE

**N83-23541#** Stanford Univ., Calif. High Temperature Gasdynamics Lab.

**CURRENT DISTRIBUTION AND NONUNIFORMITY EFFECTS IN MHD DISK GENERATORS Ph.D. Thesis**
Dennis F. Roseman Aug. 1982 156 p refs
(Contract DE-AC01-80ET-15611)
(DE83-000522; HTGL-231) Avail: NTIS HC A08/MF A01

Current distribution and nonuniformity effects in combustion driven MHD disk generators were studied. The importance of these phenomena to baseload power generation was investigated. The peg wall construction allowed current and voltage distributions to be measured. The channel was operated with plasma temperatures up to 2750 K and magnetic field strengths up to 5.5 Tesla. The magnitudes of the currents and voltages were reduced by significant loss mechanisms, primarily electrode losses and current leakage through the wall caused by potassium seed penetration of the castable ceramic between the pegs. A simple circuit model accounting for these losses was developed to be compared with analytical calculations. Under normal uniform electrical loading the distributions measured in the channel were uniform as expected. Nonuniform electrical loading was used to produce and measure effects on the current distribution that occur only in the presence of high magnetic fields as required for MHD power generation. DOE

**N83-23542#** Sandia Labs., Albuquerque, N. Mex.
**BEHAVIOR OF SUSTAINED HIGH-CURRENT ARCS ON MOLTEN-ALLOY ELECTRODES DURING VACUUM CONSUMABLE-ARC REMELTING**
F. J. Zanner and L. A. Bertram 1982 14 p refs Presented at the 10th Intern. Symp. on Discharges and Elec. Insulation in Vacuum, Columbia, S.C., 25 Oct. 1982
(Contract DE-AC04-76DP-00789)
(DE82-021251; SAND-82-1188C; CONF-821024-5) Avail: NTIS HC A02/MF A01

Vacuum consumable arc remelting is a casting process carried out in a vacuum with the aim of remelting the consumable electrode in such a way that the new ingot has improved chemical and physical homogeneity. The power which causes the melting is supplied by a vacuum arc burning between the electrodes. In order to determine the furnace partitions of electrical power and current, experiments were conducted on molten faced round electrodes. The quasi-steady melt rate was determined for both horizontally opposed 15 cm dia. Ni electrodes and for vertically suspended 40 cm dia. Inconel 718 electrodes. DOE

**N83-23543#** Ames Lab., Iowa.
**THEORY OF CURRENT-DIRECTION DEPENDENCE OF NORMAL-ZONE PROPAGATION VELOCITY IN MULTIFILAMENTARY COMPOSITE CONDUCTORS Summary Report**
John R. Clem and R. J. Bartlett (Los Alamos National Lab.) 1982 2 p refs Presented at the Appl. Superconductivity Conf., Knoxville, Tenn., 30 Nov. - 3 Dec. 1982 Prepared in cooperation with Iowa State Univ., Ames
(Contract W-7405-eng-82)
(DE82-019004; IS-M-394; CONF-821108-1-Summ) Avail: NTIS HC A02/MF A01

Normal zone propagation in a multifilamentary composite conductor is driven primarily by Joule heating in both the normal zone and the current sharing zone, which lies between the normal ($T > T$ sub c) and superconducting ($I < I$ sub c) zones. The normal zone propagation velocity along a multifilamentary Nb3Sn/Cu composite conductor has different values depending upon the direction of current flow, the velocity difference being about 10%. Some thermoelectric effect is evidently responsible for such a current direction dependence. This effect is about an order of magnitude too small to account for the experimental results in the Nb3Sn/Cu conductor. Our theory is based upon that of Dresner but includes as heat sources, in addition to the Joule contribution, Thomson heat in the normal matrix and Peltier heat at the superconductor/normal matrix interfaces in the current sharing zone. DOE

# 34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

**N83-23544*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
**GENERATION OF TOLLMIEN-SCHLICHTING WAVES BY FREE-STREAM DISTURBANCES AT LOW MACH NUMBERS**
M. E. Goldstein Mar. 1983 76 p
(NASA-TM-83026; E-1480; NAS 1.15:83026) Avail: NTIS HC A05/MF A01 CSCL 20D

The method of matched asymptotic expansions is used to study the generation of Tollmien-Schlichting waves by free stream disturbances incident on a flat plate boundary layer. Near the leading edge, the motion is governed by the unsteady boundary layer equation, while farther downstream it is governed (to lowest order) by the Orr-Sommerfeld equation with slowly varying coefficients. It is shown that there is an overlap domain where the Tollmien-Schlichting wave solutions to the Orr-Sommerfeld equation and an appropriate asymptotic solution of the unsteady boundary layer equation match, in the matched asymptotic expansion sense. The analysis leads to a set of scaling laws for the asymptotic structure of the unsteady boundary layer. Author

**N83-23545*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
**AERODYNAMIC-WAVE BREAK-UP OF LIQUID SHEETS IN SWIRLING AIRFLOWS AND COMBUSTOR MODULES**
R. Ingebo 1983 16 p refs Presented at the 19th Joint Propulsion Conf. and Tech. Display, Seattle, 27-29 Jun. 1983; sponsored by AIAA, SAE, and ASME
(NASA-TM-83353; E-1610; NAS 1.15:83353) Avail: NTIS HC A02/MF A01 CSCL 20D

Experimental mean drop diameter data were obtained for the atomization of liquid sheets injected axially downstream in high velocity swirling and nonswirling airflow. Conventional simplex pressure atomizing fuel nozzles and splash type fuel injectors were studied under simulated combustor inlet airflow conditions. A general empirical expression relating recirprocal mean drop diameter to airstream mass velocity was obtained and is presented. The finest degree of atomization, i.e., the highest value of the coefficient C, was obtained with swirl can combustor modules ($C = 15$) as compared with pressure atomizing nozzles ($C = 12$). A.R.H.

**N83-23546*#** College of William and Mary, Williamsburg, Va. Dept. of Physics.
**LONG-TIME STATES OF INVERSE CASCADES IN THE PRESENCE OF A MAXIMUM LENGTH SCALE**
Murshed Hossain, William H. Matthaeus, and David Montgomery [1983] 32 p refs Sponsored in part by DOE
(Grant NsG-7416)
(NASA-CR-170268; NAS 1.26:170268) Avail: NTIS HC A03/MF A01 CSCL 20D

It is shown numerically, both for the two-dimensional Navier-Stokes (guiding-center plasma) equations and for two-dimensional magnetohydrodynamics, that the long-time asymptotic state in a forced inverse-cascade situation is one in which the spectrum is completely dominated by its own fundamental. The growth continues until the fundamental is dissipatively limited by its own dissipation rate. Author

**N83-23547*#** Science Applications, Inc., Chatsworth, Calif.
**A MATHEMATICAL MODEL OF A LARGE OPEN FIRE**
P. T. Harsha, W. N. Bragg, and R. B. Edelman Apr. 1981 80 p refs
(NASA-CR-166475; NAS 1.26:166475) Avail: NTIS HC A05/MF A01 CSCL 20D

A mathematical model capable of predicting the detailed characteristics of large, liquid fuel, axisymmetric, pool fires is described. The predicted characteristics include spatial distributions of flame gas velocity, soot concentration and chemical specie concentrations including carbon monoxide, carbon dioxide, water, unreacted oxygen, unreacted fuel and nitrogen. Comparisons of the predictions with experimental values are also given. Author

**N83-23548#** Argonne National Lab., Ill.
**NATURAL THERMAL STRATIFICATION IN TANKS, PHASE 1 Final Report**
Roger L. Cole and Frank O. Bellinger [1982] 101 p refs
(Contract W-31-109-eng-38)
(ANL-82-5) Avail: NTIS HC A06/MF A01

How solar system tanks fail to stratify, a solar system control strategy that allows stratification, a one-dimensional analytical model of thermally stratified tanks, experimental measurement of thermal stratification in tanks, correlation of experimental measurements with empirical constants in the analytical model, and a procedure for designing thermally stratified tanks are described. The control strategy allows tanks to stratify and reduces the average collector operating temperature by as much as 20 C. The result is up to 20% improvement in system performance. The analytical model and correlation of its empirical constants allow system designers to select from several alternatives the tank configuration that provides the best stratification. A.R.H.

**N83-23549#** Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
**STRUCTURE AND BEHAVIOR OF A TURBULENT RING VORTEX**
Peter E. M. Schneider Oct. 1982 44 p refs Sponsored by Deutsche Forschungsmeinschaft
(MPIS-12/1982; ISSN-0436-1199) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 13,20

The turbulent condition of an instable ring is described. A dyed turbulent water ring vortex moving in otherwise stationary water has a warmer shell than its surroundings; a cooler core than its shell; and produces secondary vortices. Parts of these instable secondary vortices go to form the wake of the turbulent vortex. This production of secondary vortices seems to be responsible for parts of the sound spectra, both of single turbulent vortex, and of jets. The mixing of vortex core and vortex shell material in the secondary vortices is described. The core of the primary vortex controls the frequency of the series of secondary vortices by means of this mixing process. Author

**N83-23550#** Karlsruhe Univ. (West Germany). Sonderforschungsbereich 80.
**CALCULATION OF CURVED SHEAR LAYERS WITH TWO-EQUATION TURBULENCE MODELS**
W. Rodi and G. Scheuerer Jul. 1982 52 p refs Sponsored by Deutsch Forschungsmeinschaft
(SFB-80/T/211) Avail: NTIS HC A04/MF A01

Three extensions of the k-epsilon turbulence model were tested for shear-layer flows with streamline curvature. The first version is an algebraic stress model which was derived by simplification of modeled Reynolds stress equations and does not contain curvature-specific empiricism. The other two versions use modified form of the dissipation rate equation. The test cases considered are a convexly curved boundary layer, a curved mixing layer and wall jets on logarithmic spiral surfaces. The results show that the algebraic stress model gives the best overall agreement in the curved part of the flow but predicts too fast a recovery after the removal of curvature. M.G.

**N83-23551#** Technische Univ., Berlin (West Germany). Hermann-Foettinger Inst. fuer Thermo-und Fluiddynamik.
**EUROMECH 160 ON PERIODIC FLOW AND WAKE PHENOMENA**
1982 145 p refs Conf. held at Berlin, 6-9 Sep. 1982
Avail: NTIS HC A07/MF A01

Several areas of periodic flow and wake phenomena are addressed including vortex shedding, oscillator model theory, unsteady pressure, velocity fields, vortex formation, bluff body wakes, and wind induced vibrations. Author

**N83-23552#** National Aerospace Lab., Amsterdam (Netherlands). Spaceflight Div.
**STUDY ON EQUIPMENT REQUIREMENTS IN SUPPORT OF MICROGRAVITY FLUID PHYSICS EXPERIMENTS**
J. P. B. Vreeburg 30 Sep. 1981 60 p refs
(Contract ESTEC-4668/81/NL-HP)
(NLR-TR-81115-U) Avail: NTIS HC A04/MF A01

Requirements for facilities and instrumentation of a laboratory supporting microgravity fluid physics experiments and equipment developments are discussed. The requirements are based on reviews of candidate areas of experimentation and proposed or actual experiment facilities. Present deficiencies in measurement capabilities or preparation opportunities are identified. Fluid physics encompasses critical point phenomena, thermodynamics, mechanics and heat transfer in liquids. Microgravity denotes the absence of the linear 1 g acceleration field component from the effective body force field experienced by the liquid sample. Salient features of microgravity fluid physics experiments are discussed to emphasize the constraints of manned and unmanned experiment facilities. Author

**N83-23553#** Aeronautical Research Inst. of Sweden, Stockholm. Dept. of Aerodynamics.
**AN INVESTIGATION INTO THE ADVANTAGES OF FLUIDICS IN FLUID PROCESSING. PART 2: AN INVENTORY OF POWER FLUIDICS**
R. Boucher and J. R. Tippetts Aug. 1982 177 p refs
(Contract STU-79-6662)
(FFA-TN-1982-25) Avail: NTIS HC A09/MF A01

Design and use of power fluidic devices and techniques in the handling of process fluids are described. Actual and proposed applications over a broad range of industrial processes which include chemical, nuclear, water, sewage, mining and ventilation engineering are outlined. It covers the great majority of published significant applications and how power fluidics is applied to date. Likely applications environments are mentioned. E.A.K.

**N83-23554#** Aeronautical Research Inst. of Sweden, Stockholm. Dept. of Aerodynamics.
**EFFECTS OF CIRCUMSTANCIEL CURVATURE AND RADIAL STRATIFICATION OF STEWARTSON E1/3 LAYERS IN A RAPIDLY ROTATING GAS**
F. Bark and S. Meijer Nov. 1982 66 p refs
(FFA-TN-1982-44) Avail: NTIS HC A04/MF A01

In UF6 centrifuges there is, due to the strong radial variation of the density field, a strong variation of the local Ekman number between the axis of rotation and the periphery. At the periphery, the local Ekman number is very small but near the center, this quantity is not exceedingly small. This means that Stewartson layers near the center of a centrifuge are usually rather thick and are thus affected by the circumferential curvature. Such layers are also affected by the radial variation of the density field. These two effects are examined for a Stewartson layer of thickness E1/3, which is driven by an axisymmetric ring source and a concentric ring sink. A perturbation solution is given for the case when the effects of the circumferential curvature and the variation of the basic density field are weak. Author

**N83-23555#** Naval Ship Research and Development Center, Bethesda, Md. Ship Performance Dept.
**A PRELIMINARY DESIGN THEORY FOR POLYPHASE IMPELLERS IN UNBOUNDED FLOW Final Report**
B. Yim Jan. 1982 28 p refs Presented at the Winter Ann. Meeting of the Am. Soc. of Mechan. Engr., San Francisco, 10-15 Dec. 1978
(AD-A110131; DTNSRDC-82/004) Avail: NTIS HC A03/MF A01 CSCL 12/1

The main role of preliminary design for supercavitating propellers is to supply the basic data for the final design, such as: the

hydrodynamic pitch angle, the radial load distributions, the approximate cavity length and the distribution of cavity source strengths which will help determine the three dimensional cavity source distribution. For this purpose, the effective use of supercavitating cascade theory with lifting line theory is discussed together with influences of neighboring cavities on cavity drag, the hydrodynamic pitch angle, inflow retardation and the optimum pitch distribution of the propeller. The computer program developed is applied to several existing propeller models. The results show that propeller efficiency is predicted well but pitch distribution is a little larger than for the model. The results are analyzed and compared with the results of a lifting surface design method which was developed for use with the preliminary design method. S.L.

**N83-23556#** Mississippi State Univ., Mississippi State. Dept. of Aerophysics and Aerospace Engineering.
**DYNAMIC COUPLING OF BOUNDARY-FITTED COORDINATE SYSTEMS WITH THE NAVIER-STOKES EQUATIONS Final Report, 21 Sep. 1978 - 30 Sep. 1982**
Joe F. Thompson 13 Dec. 1982 10 p refs
(Contract DAAG29-80-C-0078; Grant DAAG29-78-G-0183)
(AD-A122941; ARO-15743.1-EG) Avail: NTIS HC A02/MF A01 CSCL 12/1

This research effort concerned the incorporation of a self-adjusting boundary-fitted coordinate system into a numerical solution of the time-dependent, incompressible Navier-Stokes equations. In the resulting code, the coordinate system continually adjusts itself in time to automatically concentrate lines in regions of developing flow gradients. The code is applicable to arbitrary two-dimensional bodies. This code is based on the velocity-pressure formulation with an algebraic turbulent eddy viscosity model. The solution uses second-order, central differences and is done by SOR iteration with a variable acceleration parameter field that is calculated automatically from the local velocity and grid spacing. Author (GRA)

**N83-23557#** Hydronautics, Inc., Laurel, Md.
**FREE SURFACE FLOWS WITHOUT WAVES**
Marshall P. Tulin Sep. 1982 31 p refs
(Contract N00014-80-C-0669)
(AD-A122899; TR-8035-2) Avail: NTIS HC A03/MF A01 CSCL 20/4

In this paper we explore, within the framework of first order theory, the existence of wave-free flows past submerged bodies in both two and three dimensions. This is done through consideration and mutual cancellation of the wave fields due to singularities and singularity distributions which can be interpreted in terms of body volume and vertical force distributions. The results may be of practical consequences for ship wave-making and also in connection with cavity flows beneath a free surface. GRA

**N83-23558#** California Univ., Livermore. Lawrence Livermore Lab.
**TESTS OF CRYOGENIC PIGS FOR USE IN LIQUEFIED GAS PIPELINES**
David L. Hipple and William C. ONeal 9 Sep. 1982 60 p refs
(Contract W-7405-eng-48)
(DE83-005028; UCRL-53320) Avail: NTIS HC A04/MF A01

Pipeline pigs are a key element in the design of a proposed spill test facility whose purpose is to evaluate the hazards of large spills of liquefied gaseous fuels (LGFs). A long pipe runs from the LGF storage tanks to the spill point; to produce a rapid spill, the pipe is filled with LGF and a pig will be pneumatically driven through the pipe to force out the LGF quickly and cleanly. Several pig designs were tested in a 6 inch diameter, 420 foot long pipe to evaluate their performance at liquid-nitrogen temperature and compare it with their performance at ambient temperature. For each test, the pig was placed in one end of the pipe and either water or liquid nitrogen was put into the pipe in fromt of the pig. Then pressurized drive gas, either nitrogen or helium, was admitted to the pipe behind the pig to push the pig and the fluid ahead of it out the exit nozzle. For some tests, the drive gas supply was shut off when the pig was part way through the pipe as a method of velocity control; in these cases, the pressurized gas trapped behind the pig continued to expand until it pushed the pig the remaining distance out of the pipe. DOE

**N83-23559#** Utah Univ., Salt Lake City. Dept. of Geology and Geophysics.
**SELF-POTENTIAL EFFECTS DUE TO HYDROTHERMAL CONVECTION-VELOCITY CROSSCOUPLING**
W. R. Sill May 1982 26 p refs
(Contract DE-AC07-79ID-12079)
(DE82-019924; DOE/ID-12079/68) Avail: NTIS HC A03/MF A01

The modeling of self potential effects by the use of electric and convection currents is readily adaptable to the problem of crosscoupled flows due to hydrothermal convection. In this modeling of the electrokinetic effects, all that is required is a velocity model and models of the crosscoupling parameters and the electric conductivity. A simple model of a two dimensional, divergence free velocity field is used to represent the essential features of a hydrothermal convection system. With this velocity field and the physical properties models, the electric convection current algorithm is used to calculate the electric current sources and the resultant self potential. In the examples presented, a positive self potential anomaly is generated over a plume of rising hot water. The magnitude of the anomaly could easily be of the order of hundreds of millivolts. DOE

**N83-23560#** California Univ., Livermore. Lawrence Livermore Lab.
**NUMERICAL TREATMENT OF INTERIOR BOUNDARY CONDITIONS OF THE ONSAGER EQUATION**
J. Viecelli 2 Sep. 1982 8 p refs
(Contract W-7405-eng-48)
(DE82-021012; UCID-19546) Avail: NTIS HC A02/MF A01

It was shown that the extra condition needed to fix the stream function on an interior boundary in an incompressible liquid flow is that the integral of the pressure gradient along any path enclosing the boundary should vanish. More recently this constraint was used to solve for a few special cases of compressible centrifuge flows. One way in which this contraint can be easily incorporated in a numerical scheme for solving the Onsager equation for the gas flow in a centrifuge is described. DOE

**N83-23561#** Los Alamos Scientific Lab., N. Mex.
**NUMERICAL-SOLUTION PACKAGE FOR TRANSIENT 2-PHASE-FLOW EQUATIONS**
John H. Mahaffy and Dennis Liles 1982 13 p refs Presented at the Ann. Meeting of Heat Transfer and Energy Conversion, Los Angeles, 14-18 Nov. 1982
(Contract W-7405-eng-36)
(DE82-015803; LA-UR-82-1483; CONF-821106-1) Avail: NTIS HC A02/MF A01

A description of the numerical solution package used to model two phase flow in version PF1 of the Transient Reactor Analysis Code (TRAC-PF1) is provided. This code represents all of the physical nuclear reactor components with one dimensional flow equations. The reactor vessel also may be modeled in three dimensions. This code uses the same semi-implicit finite difference method for three dimensional flow calculations as previous versions of TRAC. This numerical technique is an improvement on the well known Implicit Continuous Eulerian method. However, PF1 is substantially faster for most one dimensional calculations because a stability enhancing two step method (SETS) is used. This method eliminates the material Courant stability limit from all one dimensional regions, allowing the use of larger time steps. The SETS method was designed to propagate information needed for stability with minimal implicit coupling between spatial nodes. DOE

**N83-23562#** Pacific Northwest Lab., Richland, Wash.
***MULTI-DIMENSIONAL FINITE-ELEMENT CODE FOR THE ANALYSIS OF COUPLED FLUID ENERGY, AND SOLUTE TRANSPORT (CFEST)***

S. K. Gupta, C. T. Kincaid, P. R. Meyer, C. A. Newbill, and C. R. Cole Aug. 1982 93 p refs
(Contract DE-AC06-76RL-01830)
(DE82-022521; PNL-4260) Avail: NTIS HC A05/MF A01

The Seasonal Thermal Energy Storage Program is being conducted for the Department of Energy by Pacific Northwest Laboratory. A major thrust of this program has been the study of natural aquifers as hosts for thermal energy storage and retrieval. Numerical simulation of the nonisothermal response of the host media is fundamental to the evaluation of proposed experimental designs and field test results. This report represents the primary documentation for the coupled fluid, energy and solute transport code. Sections of this document are devoted to the conservation equations and their numerical analogues, the input data requirements, and the verification studies completed to data. DOE

**N83-23563#** Sandia Labs., Albuquerque, N. Mex. Fluid and Thermal Sciences Dept.
**NUMERICAL STUDY OF NATURAL CONVECTION IN A VERTICAL, ANNULAR, POROUS LAYER**
C. E. Hickox and D. K. Gartling 1982 22 p refs Presented at the AIAA/ASME Joint Conf. on Fluids, Plasma, Thermophys. and Heat Transfer, St. Louis, Mo., 7 Jun. 1982
(Contract DE-AC04-76DP-00789)
(DE82-008192; SAND-81-2095C; CONF-820604-6) Avail: NTIS HC A02/MF A01

Steady, nautral convection in a fluid-saturated, vertical, annular, porous layer was studied. Numerical analysis was performed using a finite element computer program based on the Galerkin form of the finite element method. Heat transfer rates are predicted for Rayleigh numbers in the range 25 to 100 with layer aspect ratios ranging from 2 to 8 and ratios of layer height-to-inner radius of 2, 4, and 8. Representative plots of isotherms and streamlines are also presented. Effects of anisotropic permeability are evaluated in a preliminary manner. Application of the results to an insulated storage tank is illustrated. DOE

**N83-23564#** California Univ., Livermore. Lawrence Livermore Lab.
**OVERPRESSURE RESULTING FROM COMBUSTION OF EXPLOSIVE GAS IN AN UNCONFINED GEOMETRY**
P. A. Urtiew 8 Feb. 1982 35 p refs
(Contract W-7405-eng-48)
(DE82-014219; UCID-19312) Avail: NTIS HC A03/MF A01

In preparation for a series of large scale spill tests of liquefied gaseous fuels, the problem of designing safe storage facilities for the fuels as part of a proposed spill test facility arose. The design had to take into account the potential hazards associated with large quantities of fuel, including the hazard of overpressures which develop during various modes of combustion or explosion. The overpressure question, the results of which are presented, was studied. All the pertinent information on overpressure that is available in the open literature is summarized and is presented in a form that can be readily converted into design criteria for the fuel storage facility. Various modes of combustion are reviewed and categorized according to their capability of producing sizable overpressures, and some comments are made on how deviations from the ideal situations considered in analytical studies will affect the results. DOE

**N83-23565#** Union Carbide Corp., Tonawanda, N.Y.
**HEAT-TRANSFER CHARACTERISTICS OF A DRY AND WET/DRY ADVANCED CONDENSER FOR COOLING TOWERS Interim Report**
H. D. Fricke, K. McIlroy, and D. J. Webster Jun. 1982 41 p refs Sponsored by EPRI
(EPRI Proj. 422-2)
(DE82-905811; EPRI-CS-2476) Avail: NTIS HC A03/MF A01

An experimental evaluation of two types of advanced, air cooled ammonia condensers for a phase change dry/wet cooling system for electric power plants is described. Condensers of similar design, but much bigger, are being tested in a 15 MWe demonstration plant. These condensers, featuring different air side augmentation, were tested in an ammonia phase change pilot plant (0.3 MWe). The first unit consisted of the integral shaved fin extruded aluminum tubing designed for dry operation. Heat transfer and air side pressure loss characteristics were measured under varying air face velocities (600 to 1000 FPM) and initial temperature differences, ITD (20 to 60 F). Overall heat transfer coefficients (based on air side surface), U, ranged between 7.0 to 8.6 Btu/hr sq ft. F. The second configuration constituted the Hoterv aluminum plate fin/tube assembly of which two different sizes (5 sq ft and 58 sq ft frontal area) were performance tested; in both dry and wet modes at 200 to 800 FPM air face velocities, ITD's of 10 to 60 F and at water deluge rates up to 3.0 gpm/ft. of core width. DOE

**N83-23566#** Lehigh Univ., Bethlehem, Pa. Dept. of Mechanical Engineering and Mechanics.
**HEAT TRANSFER TO TUBES IN FREEBOARD SPACE OF FLUIDIZED-BED COMBUSTORS Progress Report, 1 Feb. - 1 Aug. 1982**
John C. Chen, Kemal Tuzla, and Suleyman Biyikli Aug. 1982 12 p
(Contract DE-FG22-80PC-30214)
(DE82-020247; DOE/PC-30214/T4) Avail: NTIS HC A02/MF A01

Progress is reported in experimental studies of the heat transfer characteristics of tubes located in the freeboard region of fluidized beds. The objectives of this research are to: obtain experimental data for heat transfer in freeboard region for single tubes at room temperature and at FBC operating temperatures; determine the effect of operating variables (gas velocity, tube elevation, particle size, particle density, etc.) on heat transfer coefficients; develop on experimental method for determinating the dominant heat transfer mechanisms in freeboard region, from solid contact measurements, in room temperature bed; and derive phenomenological models and correlations. The test equipment has been assembled and initial results for heat transfer coefficients at temperatures from 25 C to 750 C and flow rates of 1.5 and 3.0 m/s are presented. DOE

**N83-23567#** Sandia Labs., Albuquerque, N. Mex.
**MIXTURE THEORY FOR TURBULENT DIFFUSION OF HEAVY PARTICLES**
D. F. McTigue 1982 24 p refs Presented at the Advan. Seminar on the Theory of Dispersed Multiphase Flow, Madison, Wis., 26 May 1982 Submitted for publication
(Contract DE-AC04-76DP-00789)
(DE82-019341; SAND-82-1291C; CONF-8205115-1) Avail: NTIS HC A02/MF A01

The classical sedimentation problem in view of the continuum theory of mixtures is examined. The source of the diffusive flux that balances the gravitational setting flux of negatively buoyant particles in a steady, uniform mean flow is identified. Mixture theory offers a powerful tool for examination of this problem. It provides a rigorous axiomatic framework for the dynamics of two phase flow, explicitly including exchanges of momentum between the phases. The theory very clearly demonstrates the behavior of the fluid phase, the dispersed particulate phase, and the total mixture. DOE

**N83-23568#** United Technologies Research Center, East Hartford, Conn.
**PARAMETRIC PERFORMANCE STUDIES ON FLUIDIZED-BED HEAT EXCHANGERS. TASK 1: FOULING CHARACTERISTICS Yearly Technical Progress Report, 28 Jul. 1981 31 Jul. 1982**
R. C. Stoeffler Sep. 1982 23 p refs
(Contract DE-AC22-81PC-40280)
(DE82-021005; DOE/PC-40280/T5) Avail: NTIS HC A02/MF A01

Analyses and experiments are being performed to investigate the heat transfer performance of single and multistage shallow fluidized beds for application to the recovery of heat from sources such as waste heat, and coal combustion or coal gasification. Tests were conducted to investigate the effects of liquid conden-

sate fouling on fluidized bed heat exchanger performance. Liquid condensates used in these tests were water and glycerol (which is more viscous than water). The tests showed that fluidized bed heat exchanger performance is degraded by condensation within the bed and the degradation is caused by bed particles adhering to the heat exchanger surface, not by particle agglomeration. Liquid condensate did not continuously build up within the bed. After a period of dry out, heat transfer equal to that obtained prior to condensation was again obtained. DOE

**N83-23569#** Los Alamos Scientific Lab., N. Mex.
**OPTICAL PROPERTIES OF EXPLOSIVE-DRIVEN SHOCK WAVES IN NOBLE GASES**
C. R. Jones and W. C. Davis Sep. 1982 26 p refs
(Contract W-7405-eng-36)
(DE83-000466; LA-9475-MS) Avail: NTIS HC A03/MF A01

High explosives were used to shock heat rare gases to brightness temperatures up to 36,000 K. Temperatures were determined from radiometer signals at both 280 nm and 520 nm. Shock velocities up to 9 mm/microns were used in both planar and cylindrical geometries. Neon, argon, Krypton, and xenon gases at atmospheric pressure were examined in planar shocks. Using argon, the effects of initial gas pressure and an admixed molecular species were observed. For a radial shock expansion in argon, brightness temperatures were measured over a range of shock velocities. Close agreement between brightness temperatures measured at both UV and visible wavelengths indicated that the shock fronts were radiating a blackbody spectrum. Time resolved spectrograms of the emission also suggest that these sources are blackbody radiators. For a cylindrical shock expansion in argon, explosive energy was converted to optical energy with an efficiency of 4%. DOE

**N83-23570#** Sandia Labs., Albuquerque, N. Mex.
**NUMERICAL SIMULATION OF INTERFACE DYNAMICS IN CAPILLARY-DRIVEN POROUS FLOW**
G. R. Hadley 1982 27 p refs Presented at the Fall 1982 Ann. Meeting of AICHE, Los Angeles, 14-18 Nov. 1982
(Contract DE-AC04-76DP-00789)
(DE82-018648; SAND-82-1355C; CONF-821106-2) Avail: NTIS HC A03/MF A01

A numerical simulation of capillary-driven porous flow on the scale of a few hundreds of pore diameters is presented. The simulation moves fluid-fluid interfaces dynamically, based on a computed pressure field. A qualitative comparison is made with a more common modeling approach for a simple imbibition problem. DOE

**N83-23571#** Bettis Atomic Power Lab., Pittsburgh, Pa.
**A FAMILY OF ITERATIVE PROCEDURES FOR SOLVING THE SEMI-IMPLICIT NAVIER-STOKES DIFFERENCE EQUATIONS**
L. A. Hageman Sep. 1982 105 p refs
(Contract DE-AC11-76PN-00014)
(DE82-022474; WAPD-TM-1525) Avail: NTIS HC A06/MF A01

For incompressible flow problems governed by the Navier-Stokes equations, semi-implicit discretizations of the time variable lead to a coupled system of equations that must be solved at each time point. A family of iterative procedures for solving this system is derived and preliminary analysis and numerical test results for several members of this family are presented. DOE

# 35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources.* For related information see also *06 Aircraft Instrumentation,* and *19 Spacecraft Instrumentation.*

**N83-23572** Max-Planck-Institut fuer Physik und Astrophysik, Munich (West Germany). Werner-Heisenberg-Inst. fuer Physik.
**A SEGMENTED SCINTILLATOR-LEAD PHOTON CALORIMETER USING A DOUBLE WAVELENGTH SHIFTER OPTICAL READOUT SYSTEM**
J. Fent, H. Fessler, P. Freund, H. J. Gebauer, P. Polakos, K. P. Pretzl, Th. Schouten, P. Seyboth, and J. Seyerlin Nov. 1982 26 p refs Submitted for publication
(MPI-PAE/Exp-El-109) Copyright. Avail: Issuing Activity

The construction and performance of a prototype scintillator-lead photon calorimeter using a double wavelength shifter optical readout is described. The calorimeter is divided into 4 individual cells each consisting of 44 layers of 3 mm lead plus 1 cm thick scintillator. The edges of each scintillator plate are covered by acrylic bars doped with a wavelength shifting material. The light produced in each scintillator plate is first converted in these bars, then converted a second time in a set of acrylic rods which run longitudinally through the calorimeter along the corners of each calorimeter cell. A photomultiplier is attached to each of these rods at the back end of the calorimeter. The energy resolution obtained with incident electrons in the energy range of 2-30 GeV is sigma/E = 0.12/root E. The uniformity of response across the front face of each cell was measured. Showers within each cell can be localized with an accuracy of better than sigma = 7 mm. Author

**N83-23573*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
**A BALLOON-BORNE INSTRUMENT FOR HIGH-RESOLUTION ASTROPHYSICAL SPECTROSCOPY IN THE 20-8000 KEV ENERGY RANGE**
W. Paciesas, R. Baker, D. Boclet (Centre d'Etudes Nucleaires de Saclay, France), S.L Brown, T. Cline, H. Costlow, P. Durouchoux (Centre d'Etudes Nucleaires de Saclay, France), C. Ehrmann, N. Gehrels, J. M. Hameury (Centre d'Etudes Nucleaires de Saclay, France) et al Apr. 1983 52 p refs Submitted for publication
(NASA-TM-85011; NAS 1.15:85011) Avail: NTIS HC A04/MF A01 CSCL 14B

The Low Energy Gamma ray Spectrometer (LEGS) is designed to perform fine energy resolution measurements of astrophysical sources. The instrument is configured for a particular balloon flight with either of two sets of high purity germanium detectors. In one configuration, the instrument uses an array of three coaxial detectors (effective volume equal to or approximately 230 cubic cm) inside an NaI (T1) shield and collimator (field of view equal to or approximately 16 deg FWHM) and operates in the 80 to 8000 keV energy range. In the other configuration, three planar detectors (effective area equal to or approximately square cm) surrounded by a combination of passive Fe and active NaI for shielding and collimation (field of view equal to or approximately 5 deg x 10 deg FWHM) are optimized for the 20 to 200 keV energy range. In a typical one day balloon flight, LEGS sensitivity limit (3 sigma) for narrow line features is less than or approximately .0008 ph/cm/s square (coaxial array: 80 to 2000 keV) and less than or approximately .0003 ph/square cm/s (planar array: 50 to 150 keV). Author

**N83-23574#** Siemens A.G., Munich (West Germany). Forschungslab.
**INVESTIGATIONS ON RESISTS, POLYIMIDE MASKS AND ALIGNMENT FOR X-RAY LITHOGRAPHY Final Report, Dec. 1981**
Peter Mengel and Peter Tischer Bonn Bundesministerium fuer Forschung und Technologie Dec. 1982 51 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technogie
(BMFT-FB-T-82-216; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Ger. DM 11

The fabrication technique of polyimide masks which was improved for dimensional stability to 0.3 micro when they are exposed to X-rays homogeneously were investigated. The masks

do not change their dimensions when the relative humidity changes from 40% to 60%. An optoelectronic alignment method was developed which converts the alignment marks of mask and wafer into electrical signals by a television camera. With special alignment marks the measuring error is smaller than 0.05 micro. A variation of the proximity distance between mask and wafer of approx. 10 micro does not change this accuracy. Two commercially available resists on the basis of polyfluoroalcymethacrylate were tested. A resolution of 0.3 micro is expected. They withstand the dry etching processes of SIO2 and chromium. E.A.K.

**N83-23575#** Rockwell International Corp., Thousand Oaks, Calif. Microelectronics Research and Development Center.
**RESEARCH ON SAW SENSOR BIAS STABILITY Annual Technical Report, 1 Oct. 1981 - 1 Oct. 1982**
E. J. Staples and A. P. Andrews Oct. 1982 30 p refs
(Contract MDA903-81-C-0081; ARPA Order 4061)
(AD-A122987; MRDC41082.9AR) Avail: NTIS HC A03/MF A01 CSCL 14/2

The objective is to develop SAW accelerometers with improved bias stability characteristics for moderately accurate inertial navigation. Methods of fabricating dual-resonator crystals with low absolute and differential aging characteristics have been developed. Tests have been performed on integrated noise levels for simulated guidance system mission times of up to 20 minutes. Error rates less than 50 meters per hour in position of accuracy have been achieved. Author (GRA)

**N83-23576#** Sandia Labs., Albuquerque, N. Mex.
**IMPROVING THE DEPENDABILITY OF CRITICAL THERMOCOUPLE THERMOMETRY FOR FOSSIL-FUEL GASIFIERS AND RETORTS**
R. P. Reed Jul. 1982 54 p refs
(Contract DE-AC04-76DP-00789)
(DE82-020053; SAND-82-0341) Avail: NTIS HC A04/MF A01

Critical thermocouple thermometry is such a measurement in which either excessive error or loss of signal can result in unacceptable consequences. To avoid these consequences it is necessary that the thermometry survive whatever adverse environment accompanies the measurement; however, it is just as essential to accomplish definite, adequate, demonstrated accuracy. This report describes some of the more significant problems involved in applying thermocouple thermometry in hostile environments. For example a hostile environment is encountered in some locations in gasifiers and retorts; there sensor damage is likely. A model of defective thermocouples is used to describe several damage mechanisms, their effects on dependability, and the symptoms that allow their detection. The model illustrates why many significant errors can occur unrecognized and demonstrates the practical need for real-time validation diagnostics. Special continual diagnostic techniques are described that can help to establish the dependability of critical measurement throughout the period of use. DOE

**N83-23577#** Midwest Research Inst., Golden, Colo. Renewable Resource Assessment and Instrumentation Branch.
**RESULTS OF A TRAINING EXERCISE IN THE COMPARISON AND CALIBRATION OF PYRANOMETERS AND PYRHELIOMETERS**
Daryl R. Myers Sep. 1982 70 p refs
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE82-022229; SERI/TR-215-1519) Avail: NTIS HC A04/MF A01

An intercomparison and calibration exercise was conducted. The exercise involved applying classical comparison and calibration techniques to pyranometers and pyrheliometers. As well as demonstrating the techniques for acquiring and reducing calibration data, analysis of the data indicates the relative performance of the instruments tested and the effects of the radiation distribution and meteorological parameters on the calibration. Variability in calibration results within a day amounted to + or - 5.0% and was repeatable from day to day within about + or - 2.0%. The solar evaluation angles were between 35 and 68 deg, and the diffuse to global radiation ratio was on the order of 20%. DOE

**N83-23578#** Sandia Labs., Albuquerque, N. Mex.
**PHOTOGRAPHIC-IMAGE STORAGE IN ION-IMPLANTED PLZT CERAMICS**
P. C. Peercy and C. E. Land 1982 28 p refs Presented at the Intern. Conf. on Ion Beam Modification of Mater., Grenoble, France, 6 Sep. 1982
(Contract DE-AC04-76DP-00789)
(DE82-021871; SAND-82-0773C; CONF-820945-1) Avail: NTIS HC A03/MF A01

Photographic images can be stored in transparent lead lanthanum zirconate titanate (PLZT) ceramics using near-UV light with photon energies near the band gap energy of 3.42 eV. Coimplanting inert ions, e.g., Ar, Ne, and He, into the surface exposed to image light can increase near-UV photosensitivity by a factor of almost 10,000 with no degradation of image quality, so that the exposure energy threshold is reduced from approx. 100 micron J/sq cm to approx. 10 micron J sq cm. Coimplanting chemically active and inert ions, e.g., Al or Cr and Ne, can result in similiar improvement of the extrinsic (visible light) photosensitivity and in an essentially flat photoresponse from about 400 to 600 nm. In addition, thermal diffusion of Al followed by Ne implantation yield photosensitivity increases in the near-UV comparable to the best results obtained to date with ion implantation. DOE

**N83-23579#** Rockwell International Corp., Golden, Colo. Energy Systems Group.
**IN-PLACE CALIBRATION OF MOISTURE MONITORS**
R. L. Thompson, D. M. Griffin, G. A. Riordan, ed., and L. M. Morales, comp. 30 Sep. 1982 11 p
(Contract DE-AC04-76DP-03533)
(DE83-001103; RFP-3380) Avail: NTIS HC A02/MF A01

An inexpensive, relatively quick calibration technique, used to calibrate moisture measuring instruments in Rocky Flats process lines is described. The moisture monitors utilize electrolytic cells to continuously monitor the moisture content of argon supply gases. The method decreases the required down time of the measuring instrument from days to hours. DOE

**N83-23580#** Los Alamos Scientific Lab., N. Mex.
**HAND-HELD PULSE-TRAIN-ANALYSIS INSTRUMENT**
K. V. Nixon and C. Garcia 1982 5 p refs Presented at IEEE Nucl. Sci. Symp., Washington, D.C., 20 Oct. 1982
(Contract W-7405-eng-36)
(DE83-002060; LA-UR-82-2973; CONF-821011-5) Avail: NTIS HC A02/MF A01

A portable hand-held pulse-train-analysis instrument is described using a number-oriented microprocessor sequenced by a single component microprocessor. The incorporation of new CMOS integrated circuits makes possible complex analysis in a small, easily operated, battery-powered unit. The instrument solves an immediate problem with threshold setting of plastic scintillators and promises numerous other applications. DOE

**N83-23581#** Los Alamos Scientific Lab., N. Mex.
**HIGH-INTENSITY X-RAY HOLOGRAPHY: AN APPROACH TO HIGH-RESOLUTION SNAPSHOT IMAGING OF BIOLOGICAL SPECIMENS**
J. C. Solem Aug. 1982 125 p refs
(Contract W-7405-eng-36)
(DE83-000473; LA-9508-MS) Avail: NTIS HC A06/MF A01

The crucial physical and technological issues pertaining to the holographic imaging of biological structures with a short pulse, high intensity, high quantum energy laser were examined. The limitations of X-ray optics are discussed. Alternative holographic techniques were considered, and it was concluded that far field Fresnel transform holography (Fraunhofer holography) using a photoresist recording surface is most tractable with near term technology. The hydrodynamic expansion of inhomogeneities within the specimen is discussed. It is shown that expansion is the major source of image blurring. Analytic expressions were derived for the explosion of protein concentrations in an X-ray transparent cytoplasm, compared with numerical calculations, and corrections derived to account for the competitive transport processes by which

these inhomogeneities lose energy. It is concluded that for the near term Fresnel transform holography, particularly, far field or Fraunhofer holography, is more practical than Fourier transform holography. Of the altenative fine grain recording media for use with Fresnel transform holography, a photo resist is most attractive. DOE

**N83-23582#** Los Alamos Scientific Lab., N. Mex.
**RESONANCE-FILTERED BEAM SPECTROMETER**
R. M. Brugger (Missouri Univ., Columbia), A. D. Taylor (Rutherford Appleton Lab., Chilton, Engl.), C. E. Olsen, J. A. Goldstone, and A. K. Soper 1982 36 p refs Presented at the 6th Ann. Intern. Collaboration of Advanced Neutron Sources Meeting, Argonne, Ill., 28 Jun. 1982
(Contract W-7405-eng-36)
(DE83-000643; LA-UR-82-2681; CONF-8206118-6) Avail: NTIS HC A03/MF A01

An inelastic neutron scattering spectrometer which operates in the range 1 eV to 15 eV was developed. Based on a nuclear resonance filtering the beam, the concept was tested in direct, inverted and sample geometries. A number of resonance filters were tested to determine their effectiveness. The spectrometer is described and examples of data are presented. DOE

**N83-23583#** California Univ., Berkeley. Lawrence Berkeley Lab. Physics, Computer Science and Mathematics Div.
**IMAGING PERFORMANCE OF A MULTIWIRE PROPORTIONAL-CHAMBER POSITRON CAMERA**
V. Perez-Mandez, A. DelGuerra (Inst. de Fisica dell'Univ., Pisa, Italy), W. R. Nelson (Stanford Linear Accelerator Center, Calif.), and K. C. Tam (General Electric Co., Schenectady, N.Y.) Aug. 1982 10 p refs Presented at the IEEE Computer Soc. Intern. Symp. on Med. Imaging and Image Interpretation, Berlin, 26-28 Oct. 1982
(Contract DE-AC03-76SF-00098)
(DE83-000496; LBL-14114; CONF-821029-3) Avail: NTIS HC A02/MF A01

A fully three dimensional positron camera is presented, made of six multiwire proportional chamber modules arranged to form the lateral surface of a hexagonal prism. A true coincidence rate of 56000 c/s is expected with an equal accidental rate for a 400 micron Ci activity uniformly distributed in an approximately 3.1 water phantom. A detailed Monte Carlo program was used to investigate the dependence of the spatial resolution on the geometrical and physical parameters. A spatial resolution of 4.8 mm FWHM was obtained for a F-18 point like source in a 10 cm radius water phantom. The main properties of the limited angle reconstruction algorithms are described in relation to the proposed detector geometry. DOE

**N83-23584#** California Univ., Livermore. Lawrence Livermore Lab.
**CAMAC INSTRUMENTATION IN AN HP/1000 ENVIRONMENT**
S. J. Telford 6 Aug. 1982 16 p refs Presented at the HP 1000 Intern. Users Group Intern. Conf., Long Beach, Calif., 30 Aug. - 9 Sep. 1982
(Contract W-7405-eng-48)
(DE82-020344; UCRL-87612; CONF-820847-1) Avail: NTIS HC A02/MF A01

Experimental environments often have very diverse and demanding data acquisition requirements. The HP data acquisition computer system was expanded to include the CAMAC standard of instrumentation and interface. A brief description of the CAMAC standard will be presented followed by hardware and software implementation details of the CAMAC standard on HP computers. The CAMAC software library allows the user to perform all the basic CAMAC functions as well as transfer data to and from CAMAC modules in a number of different modes. Details of this library will be presented including manipulation of the crate controller and error handling. I/O performance of the MARS system using this library will also be presented. Included will be a list of published literature concerning the standard and a list of CAMAC equipment suppliers. This paper wil introduce the HP 1000 computer user to the CAMAC standard of instrumentation and show how the MARS experiment a Lawrence Livermore National Laboratory has implemented this standard. DOE

**N83-23585#** Brookhaven National Lab., Upton, N. Y. Safety and Environmental Protection Div.
**CALIBRATION OF PROPORTIONAL COUNTERS IN MICRODOSIMETRY**
Matesh N. Varma 1982 11 p refs Presented at the 8th Symp. on Microdosimetry, Julich, West Germany, 27 Sep. - 1 Oct. 1982 Submitted for publication
(Contract DE-AC02-76CH-00016)
(DE82-022048; BNL-31777; CONF-820931-5) Avail: NTIS HC A02/MF A01

Many microdosimetric spectra for low LET as well as high LET radiations are measured using commercially available (similar to EG and G) Rossi proportional counters. The corrections to be applied to data when calibration of the counter is made using one type of radiation, and then the counter is used in a different radiation field. The principal correction factor is due to differences in W-value of the radiation used for calibration and the radiation for which microdosimetric measurements are made. Both propane and methane base tissue-equivalent (TE) gases are used in these counters. When calibrating the detectors, it is important to use the correct stopping power value for that gas. Deviations in y-bar/sub F/ and y-bar/sub D/ are calculated for Co-60 using different extrapolation procedures from 0.15 keV/micrometers to zero event size. These deviations can be as large as 30%. Advantages of reporting microdosimetric parameters such as y-bar/sub F/ and y-bar/sub D/ above a certain minimum cut-off are discussed. DOE

**N83-23586#** California Univ., Berkeley. Lawrence Berkeley Lab.
**DEVELOPMENT OF A TUNABLE ZEEMAN SPECTROMETER FOR ANALYSIS OF TOXIC ORGANIC COMPOUNDS Final Report, May 1980 - Oct. 1981**
T. Hadeishi, R. McLaughlin, J. Millaud, and Donald R. Scott Nov. 1982 62 p refs
(Contract DE-AC03-76SF-00098)
(PB83-139535; EPA-600/4-82-067) Avail: NTIS HC A04/MF A01 CSCL 14B

The application of a high resolution ultraviolet-visible absorption technique called tunable atomic line molecular spectroscopy to the detection of a variety of volatile organic molecules was investigated. A prototype instrument was built and tested to demonstrate the detection of both small (i.e., less than four atoms) and complex molecules. A more compact instrument was then constructed. This second instrument was optimized for the detection of the more complex organic molecules benzene and chlorobenzene. GRA

**N83-23587#** Little (Arthur D.), Inc., Cambridge, Mass.
**EVALUATION OF POTENTIAL VOC SCREENING INSTRUMENTS Final Report, Dec. 1980 - Mar. 1982**
Kenneth T. Menzies and Rose E. Fasano Nov. 1982 96 p refs
(Contract EPA-68-02-3111)
(PB83-139733; EPA-600/7-82-063) Avail: NTIS HC A05/MF A01 CSCL 14B

The evaluation of potential fugitive source emission screening instruments for analysis of volatile organic compounds (VOCs) is described. An initial review of available portable VOC detection instruments indicated that detectors operating on several principles (i.e., flame ionization, catalytic combustion, photoionization, infrared absorption, and thermal conductivity) might be useful for VOC analysis. Instruments utilizing photoionization and infrared may be able to meet necessary criteria for practical and accurate VOC analysis of highly substituted organics. Therefore, three commercially available instruments were modified and evaluated for 32 such compounds in concentrations of 100 to 10,000 ppmv. Results show that photoionization may be suitable for general VOC screening. Infrared absorption may be useful for analyzing some classes of organic compounds. GRA

# 36 LASERS AND MASERS

Includes parametric amplifiers.

**N83-23588*#** Florida Univ., Gainesville.
**RESEARCH ON SOLAR PUMPED LIQUID LASERS Annual Progress Report, 1 Jan. - 31 Dec. 1982**
Richard T. Schneider, Ulrich H. Kurzweg, John D. Cox, and Neil H. Weinstein Mar. 1983 34 p refs
(Grant NAG1-135)
(NASA-CR-170298; NAS 1.26:170298) Avail: NTIS HC A03/MF A01 CSCL 20E

A solar pumped liquid laser that can be scaled up to high power (10Mw CW) for space applications was developed. Liquid lasers have the inherent advantage over gases in that they provide much higher lasant densities and thus high power densities. Liquids also have inherent advantages over solids in that they have much higher damage thresholds and are much cheaper to produce for large scale applications. Among the liquid laser media that are potential candidates for solar pumping, the POC13:Nd(3+):ZrC14 liquid was chosen for its high intrinsic efficiency as well as its relatively good stability against decomposition due to protic contamination. The development and testing of the laser liquid and the development of a large solar concentrator to pump the laser was emphasized. The procedure to manufacture the laser liquid must include diagnostic tests of the solvent purity (from protic contamination) at various stages in the production process. S.L.

**N83-23589*#** Rensselaer Polytechnic Inst., Troy, N. Y.
**FREE-ELECTRON LASER FROM WAVE-MECHANICAL BEATS OF 2 ELECTRON BEAMS Final Report**
Roland M. Lichtenstein [1982] 178 p
(Grant NsG-1628)
(NASA-CR-170291; NAS 1.26:170291) Avail: NTIS HC A09/MF A01 CSCL 20E

It is possible, though technically difficult, to produce beams of free electrons that exhibit beats of a quantum mechanical nature. (1) the generation of electromagnetic radiation, e.g., light, based on the fact that the beats give rise to alternating charge and current densities; and a frequency shifter, based on the fact that a beam with beats constitutes a moving grating. When such a grating is exposed to external radiation of suitable frequency and direction, the reflected rediation will be shifted in frequency, since the grating is moving. A twofold increase of the frequency is readily attainable. It is shown that it is impossible to generate radiation, because the alternating electromagnetic fields that accompany the beats cannot reform themselves into freely propagating waves. The frequency shifter is useless as a practical device, because its reflectance is extremely low for realizable beams. S.L.

**N83-23590#** Swedish Space Corp., Stockholm.
**CONCLUSIONS FROM THE EVALUATION AND TESTING OF THE SWEDISH MOBILE LIDAR SYSTEM: SUMMARY REPORT**
Kent Fredriksson (National Swedish Environmental Protection Board, Nykoeping, Sweden) 1982 61 p refs Sponsored by National Swedish Environment Protection Board
Avail: NTIS HC A04/MF A01

A mobile lidar system was constructed in 1979. A two and a half year period of evaluation, testing and improving of this system was carried out. The conclusions from the evaluation of the lidar system and the lidar technique are presented. The functioning of the system is critically examined, and the activities in the evaluation and testing process are listed. Some examples of measurements are given and the measurement accuracy is discussed. The sphere of plication of the technique for monitoring atmospheric pollutants is discussed and the continuing research and routine applications are briefly outlined. Author

**N83-23591#** Research Inst. of National Defence, Linkoeping (Sweden).
**USING A PULSED TEA CO2-LIDAR TO MEASURE ATMOSPHERIC SCATTERING AND WATER VAPOR**
Goeran Bolander, Tomas Claesson, and Ove Steinvall Nov. 1982 67 p refs
(FOA-C-30304-E1) Avail: NTIS HC A04/MF A01

The usefulness of a pulsed CO2-TEA lidar for atmospheric remote sensing is analyzed. In a theoretical review the maximum ranges using atmospheric backscatter are investigated as well as methods for measuring the attenuation and scattering coefficients. The accuracy of the dial method for range resolved gas concentration monitoring is analyzed and an example of water vapor profiling is given. Measurements were performed with a direct detection CO2-TEA lidar. Emphasis was put on investigating the potential for single-ended extinction measurements in the 10 microns wavelength region. For horizontal paths good correlation was found between attenuation evaluated from atmospheric backscatter and from measurements against reference targets. Vertical soundings revealed a decrease in backscatter up to a factor 10 during the first kilometer. Range resolved water vapor was measured out to 1 km using a 75 m range cell. Author

**N83-23592#** IBM Research Lab., San Jose, Calif.
**HIGH RESOLUTION LASER SPECTROSCOPY OF COLOUR CENTRES**
R. M. MacFarlane, R. T. Harley, and R. M. Shelby 21 Dec. 1982 25 p refs Presented at the 4th Europhys. Topical Conf. on Lattice Defects in Ionic Crystals, Dublin, 30 Aug. - 3 Sep. 1982 Submitted for publication
(Contract N00014-81-C-0165; NR Proj. 421-001)
(AD-A122921; TR-4) Avail: NTIS HC A02/MF A01 CSCL 20/2

The application of narrow band dye lasers to high resolution spectroscopy within the inhomogeneously broadened zero-phonon lines of colour centres is reviewed. Most work so far has centred on the use of holeburning which is exhibited by the majority of centres examined. This technique has been used to make detailed Stark and Zeeman effect measurements. In addition, optical coherent transients have been used to determined dephasing times and the results of optical phase switching and free decay experiments are discussed. Author (GRA)

**N83-23593#** Rochester Univ., N. Y. Dept. of Chemistry.
**MODEL FOR THE PROPAGATION OF PULSED SURFACE POLARITONS WITH QUASI-SELF-INDUCED TRANSPARENCY Interim Technical Report**
Xi-Yi Huang, Jui-teng Lin, and Thomas F. George Dec. 1982 29 p refs
(Contract N00014-80-C-0472)
(AD-A122905; UROCHESTER/DC/82/TR-27) Avail: NTIS HC A03/MF A01 CSCL 20/5

The possibility of quasi-self-solid interface is investigated. A theoretical model combining the optical Bloch and Maxwell equations is presented. The boundary conditions of the interface system lead to a closed relation between the laser pulse velocities in each of the two media. The behavior of transverse phase oscillations in hyperbolic secant pulses, due to the properties of the interface and the restriction of the pulse duration, are discussed. GRA

**N83-23594#** Defense Intelligence Agency, Washington, D.C. Directorate for Scientific and Technical Intelligence.
**BIBLIOGRAPHY OF SOVIET LASER DEVELOPMENTS, NUMBER 53, MAY - JUNE 1981**
20 Jul. 1982 164 p
(AD-A122906; DIA-DST-2700Z-004-82) Avail: NTIS HC A08/MF A01 CSCL 05/2

This is the Soviet Laser Bibliography for May-June 1981, and is No. 53 in a continuing series on Soviet laser developments. The coverage includes basic research on solid state, liquid, gas, and chemical lasers; components; nonlinear optics; spectroscopy of laser materials; ultrashort pulse generation; crystal growing; theoretical aspects of advanced lasers; and general laser theory. Laser applications are listed under biological effects; communications; beam propagation; computer technology; holography; laser-induced chemical reactions; measurement of laser parame-

ters; laser measurement applications; laser-excited optical effects, laser spectroscopy; beam-target interaction; and plasma generation and diagnostics. Author (GRA)

**N83-23595#** Naval Postgraduate School, Monterey, Calif.
**FLOW CONTROL ABOUT AN AIRBORNE LASER TURRET M.S. Thesis**
Larry Ellis Penix Jun. 1982 60 p refs
(Contract MIPR-28-MP-075; AF Proj. 6231)
(AD-A123056; NPS-67-82-007) Avail: NTIS HC A04/MF A01 CSCL 20/14

This thesis project is the latest in a series of experiments conducted at the Naval Postgraduate School to improve the air flow in which a laser beam propagates. The particular turret to be studied is currently employed on Airborne Laser Laboratory which is aboard the NKC-135 aircraft; a one-third scale model was constructed in the 5 x 5 foot wind tunnel. The objective is to decrease the optical path distortion and jitter resulting from turbulent flow in the aft hemisphere of the turret that houses the laser telescope. GRA

**N83-23596#** Michigan Univ., Ann Arbor. Laser Plasma Research Lab.
**A WAXICON MIRROR-ELECTRODE FOR LASER INITIATED DISCHARGE CHANNELS Interim Report**
R. M. Gilgenbach 30 Sep. 1982 19 p refs
(Contract N00014-81-K-0700)
(AD-A123057; LPRL-TR-111) Avail: NTIS HC A02/MF A01 CSCL 20/5

A reflecting waxicon (compound waxicon) has been demonstrated to generate a smooth CO2 laser-induced breakdown plasma in atmospheric pressure air. The protruding central cone of the waxicon also functions as an electrode for 30 kV laser initiated discharges. The waxicon mirror-electrode has several advantages over conventional focusing systems for laser initiated discharges in unfiltered air: (1) Smoother laser induced breakdown plasma, (2) Concentration of laser energy deposition in the plasma near the tip electrode, (3) More compact laser initiated discharge experiments since long focal length lenses of mirrors are not required, and (4) A self contained focusing system - electrode for laser triggered switches. GRA

**N83-23597#** California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
**KINETICS OF LASER-PULSE VAPORIZATION OF URANIUM DIOXIDE BY MASS SPECTROMETRY**
Cheun-horng Tsai and Donald R. Olander Mar. 1982 9 p refs Presented at the Am. Nucl. Soc. Winter Meeting, Washinton, 14-19 Nov. 1982
(Contracts W-7405-eng-48; DE-AC03-76SF-00098)
(DE82-014473; LBL-14247; CONF-821103-1) Avail: NTIS HC A02/MF A01

Safety analyses of nuclear reactors require knowledge of the evaporation behavior of UO2 at temperatures well above the melting point of 3140 K. Rapid transient heating of a small spot on a UO2 specimen was accomplished by a laser pulse which generates a surface temperature excursion. This in turn vaporizes the target surface and the gas expands into vacuum. The surface temperature transient was monitored by a fast response automatic optical pyrometer. A computer program was developed to simulate the laser heating process and calculate the surface temperature evolution. A quadrupole mass spectrometer was used to identify and analyze the major vapor species in the vaporizing flow, and to measure the rate of evaporation from the target surface. The information yielded the partial vapor pressure of each species and the composition in the vapor jet. The maximum surface temperatures investigated range from approximately 3700 K to approximately 4300 K. Author

**N83-23598#** Sandia Labs., Albuquerque, N. Mex.
**LASER-DIODE-INDUCED PHOTOBLEACHING AT LOW TEMPERATURES IN Co-60 IRRADIATED FIBERS**
C. E. Barnes Sep. 1982 27 p refs Presented at the IEEE Ann. Conf. on Nucl. and Space Radiation Effect, Las Vegas, Nev., 20 Jul. 1982
(Contract DE-AC04-76DP-00789)
(DE82-020982; SAND-82-0780C; CONF-820708-9) Avail: NTIS HC A03/MF A01

Laser diode (830 nm) induced photobleaching effects were studied primarily at -55 C in a variety of fibers including polymer clad pure silica core, fluorosilicate clad pure silica core, and doped core fibers which were exposed to Co-60 irradiation with and without simultaneous CW laser light passing through the fibers. Thermal and laser induced recovery at -55 C following irradiation was also examined. Those fiber parameters which were found to affect the extent of photobleaching were dopant content in the core, especially phosphorus, OH concentration in the core, and saturation of induced attenuation. The optimum fiber which shows minimal attenuation after irradiation and photobleaching is one that has an undoped core with high OH content. DOE

**N83-23599#** Los Alamos Scientific Lab., N. Mex.
**MULTIPLE-PHOTON LASER-INDUCED FLUORESCENCE**
Joe J. Tiee, Monty J. Ferris, Gary W. Loge, Fred B. Wampler, and Allen Hartford, Jr. 1982 5 p refs Presented at the 1st Intern. Congr. on Appl. of Lasers and Electro-Opt., Boston, 21-23 Sep. 1982
(Contract W-7405-eng-36)
(DE82-021893; LA-UR-82-2452; CONF-820949-2) Avail: NTIS HC A02/MF A01

The technique of multiple photon laser induced fluorescence was used to study the spectroscopy and dynamics of atoms, molecules, and free radicals. Among the species investigated were iodine atoms, carbon monoxide, molecular iodine, and HS and DS radicals. DOE

**N83-23600#** California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
**NONLINEAR EFFECTS OF MATERIALS IN LASER CAVITIES Ph.D. Thesis**
Raymond H. Hsu Aug. 1982 235 p refs
(Contract DE-AC03-76SF-00098; Grant NSF DMR-78-13826)
(DE83-001545; LBL-11519) Avail: NTIS HC A11/MF A01

The concept of adding intensity dependent losses to a laser cavity to control output pulse shape is reviewed. Background theory and models for Kerr liquids using ellipse rotation to achieve these inducible losses are developed. Detailed calculations and experiments are performed using the liquid crystal MBBA in a ruby laser cavity. The proper choices of parameters to optimize the technique are discussed. Self focusing inside a laser resonator was found to play an important role in the lasing process. Its effects on laser output were investigated. DOE

**N83-23601#** Los Alamos Scientific Lab., N. Mex.
**A COMPACT RESISTIVELY STABILIZED EXCIMER LASER FOR INJECTION- AND MODE-LOCKING APPLICATIONS**
Robert C. Sze 1982 7 p refs Presented at the 4th Intern. Symp. on Gas Flow and Chem. Lasers, Stresa, Italy, 13-17 Sep. 1982
(Contract W-7405-eng-36)
(DE82-021885; LA-UR-82-2424; CONF-820947-1) Avail: NTIS HC A02/MF A01

A miniature, resistively stabilized excimer laser was developed. The laser has 86 separately stabilized discharges within a length of only 27.6 cm, which allows for a total cavity length of only 33 cm. Presently, with a 2.5-mm electrode separation, over 1 mJ per pulse energy in XeCl was obtained and the laser was operated over 70 Hz without gas flow. Pulse lengths as long as 40 ns full width at half maximum intensity and over 80 ns total lasing time was observed. The beam divergence is measured at three time the diffraction limit. This laser is expected to be suited for injection locking and mode locking applications. DOE

**N83-23602#** Los Alamos Scientific Lab., N. Mex.
**COMPACT 75-WATT CO2 LASER AT 750 HERTZ**
Robert C. Sze 1982 6 p ref Presented at the 4th Intern.

Symp. on Gas Flow and Chem. Lasers, Stresa, Italy, 13-17 Sep. 1982
(Contract W-7405-eng-36)
(DE82-021889; LA-UR-82-2425; CONF-820947-2) Avail: NTIS HC A02/MF A01

The operation of a compact CO2 laser that operates to 750 Hz at 100 mJ/pulse in the TEM/sub 00/ mode is described. The device is line and power tunable ranging from milliwatts to 75 W average power. DOE

**N83-23603#** California Univ., Livermore. Lawrence Livermore Lab.
**THE X-RAY BACKLIGHTING CHARACTERIZATION EXPERIMENTS PERFORMED WITH LASER WAVELENGTHS OF 1.06, 0.53 AND 0.35 MU**
D. L. Matthews, E. M. Campbell, and N. Ceglio 1982 24 p refs Presented at CLEOS Conf., Phoenix, Ariz., 14 Apr. 1982
(Contract W-7405-eng-48)
(DE82-020177; UCRL-86910; CONF-820435-4) Avail: NTIS HC A02/MF A01

The conversion efficiency, xi/sub x/, for production of X-ray backlighting line sources from 1.4 keV to 8.6 keV as a function of laser wavelength, pulselength and intensity is reported. For K-shell X-ray line emission only a moderate increase in xi/sub x/ was observed when using a 0.35 micron (instead of 1.06 micron) wavelength laser. DOE

**N83-23604#** California Univ., Livermore. Lawrence Livermore Lab.
**THE NOVA CONTROL SYSTEM: GOALS, ARCHITECTURE AND SYSTEM DESIGN**
G. J. Suski, J. M. Duffy, D. G. Gritton, F. W. Holloway, J. R. Krammen, R. G. Ozarski, J. R. Severyn, and P. J. VanArsdall 19 May 1982 25 p refs Presented at the IFAC Workshop on Distributed Computer Control Systems, Tallinn, 24-26 May 1982
(Contract W-7405-eng-48)
(DE82-015909; UCRL-86827; CONF-820561-2) Avail: NTIS HC A02/MF A01

The control system for the Nova laser must operate reliably in a harsh pulse power environment and satisfy requirements of technical functionality, flexibility, maintainability and operability. It is composed of four fundamental subsystems: power conditioning, alignment, laser diagnostics, and target diagnostics, together with a unifying subsystem called the central controls. The system architecture utilizes a collection of distributed microcomputers, minicomputers, and components interconnected through high speed fiber optic communications systems. The design objectives development strategy and architecture of the overall control system and each of its four fundamental subsystems are discussed. DOE

**N83-23605#** Los Alamos Scientific Lab., N. Mex.
**THE ROLE OF DIAGNOSTIC TESTING IN IDENTIFYING AND RESOLVING DIMENSIONAL-STABILITY PROBLEMS IN ELECTROPLATED LASER MIRRORS**
R. L. Cutler and B. Hogan 1982 6 p refs Presented at the SPIE 26th Ann. Intern. Symp., San Diego, Calif., 23-27 Aug. 1982
(Contract W-7405-eng-36)
(DE82-021882; LA-UR-82-2391; CONF-820822-10) Avail: NTIS HC A02/MF A01

The metal mirrors which are to be used in the Antares inertial fusion laser system are discussed. Antares is a high-power, high-energy, pulsed CO2 laser system for the investigation of inertial confinement fusion. The system contains more than 400 small and large diamond-turned and conventionally polished mirrors. The substrates are type 2124 aluminum for most large mirrors, and aluminum bronze, oxygen-free copper or a copper-zirconium alloy for most of the smaller mirrors. The optical surface is electro deposited copper 20 to 40 mils thick. After nondestructive testing and rough machining, the electroplated surface is singlepoint diamond machined or conventionally polished. DOE

# 37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

**N83-23606*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
**CAVITATION PITTING AND EROSION OF Al 6061-T6 IN MINERAL OIL AND WATER**
Bezzam C. S. Rao (Concordia Univ., Montreal) and Donald H. Buckley 1983 7 p refs Presented at the Cavitation and Polyphase Flow Forum, Houston, Tex., 20-22 Jun. 1983; sponsored by ASME
(NASA-TM-83345; E-1516; NAS 1.15:83345) Avail: NTIS HC A02/MF A01 CSCL 11F

The authors are currently carrying out a study of the cavitation erosion of different bearing metals and alloys in mineral oils were studied. The variations of weight loss, the pit diameter and depth due to cavitation erosion on Al 6061-T6 in mineral oil and water are presented. S.L.

**N83-23607*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
**PRACTICAL SMALL-SCALE EXPLOSIVE SEAM WELDING**
Larence J. Bement Apr. 1983 21 p refs Presented at the 17th Aerospace Mech. Symp., Pasadena, Calif., 5-6 May 1983 Previously announced in NASA-CP-2273
(NASA-TM-84649; L-15622; NAS 1.15:84649) Avail: NTIS HC A02/MF A01 CSCL 13H

Joining principles and variables, types of joints, capabilities, and current and potential applications are described for an explosive seam welding process developed at NASA Langley Research Center. Variable small quantities of RDX explosive in a ribbon configuration are used to create narrow (less than 0.5 inch), long length, uniform, hermetrically sealed joints that exhibit parent metal properties in a wide variety of metals, alloys, and combinations. The first major all application of the process is the repair of four nuclear reactors in Canada. Potential applications include pipelines, sealing of vessels, and assembly of large space structures. A.R.H.

**N83-23608#** Bergbau-Forschung G.m.b.H., Essen (West Germany).
**FLAT DRILLING HEAD FOR FULL-FACE TUNNELING MACHINES Final Report, Jan. 1981**
Werner Wehrmann and Helmut Otto Bonn Bundesministerium fuer Forschung und Technologie Dec. 1982 180 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-225; ISSN-0340-7608) Avail: NTIS HC A09/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 35

The technology in the fields of full-face tunneling machines with flat cutting head, of roadway support, and measuring technology could be developed to full operational reliability. The problems encountered can be brought to solution by systematic investigation and logical development work. By analysis of measured data the working method and the behavior of the flat drilling head during roadheading can be optimized. Systematic logging and evaluation of all important machine parameters, problem analyses by program of work is described. Substantial improvement of the measuring technology as well as performance improvement of the flat drilling head was obtained. To a large extent the weak-points were eliminated. The method enables to cut a flat (i.e., vertical face) with resulting stability. For safety reasons and for checking the operation behavior of the drilling head a measurement-based alarm system (early-warning system) is required. Author

**N83-23609#** Societe Nationale Industrielle Aerospatiale, Les Mureaux (France). Aircraft Div.
**SLEEVE COLD EXPANSION: AIRCRAFT DIVISION POINT OF VIEW**

1982 21 p Presented at a Discussion Meeting, London, 9 Sep. 1982
(SNIAS-822-111-108) Avail: NTIS HC A02/MF A01

Tests on the fatigue effect of cold expansion in aluminum alloy structures were conducted. The results presented concern three typical applications of this process: improved performance of high load transfer joints, improved lug performance, and repair of fatigue damaged holes with and without cracks detected by NDT methods. These tests were carried out with sinusoidal monotonic loading. B.G.

**N83-23610#** Oak Ridge National Lab., Tenn. Engineering Technology Div.
**TWO-PHASE, TWO-COMPONENT STIRLING ENGINE WITH CONTROLLED EVAPORATION**
C. D. West Dec. 1982 19 p refs
(Contract W-7405-eng-26)
(DE83-005172; ORNL/TM-8524) Avail: NTIS HC A02/MF A01

In a Stirling-like engine, the specific power can be greatly increased by the use of a two component, two phase working fluid. Theory and experiments have indicated that a two to threefold increase is easily attainable. It is shown that by controlling the rate at which the liquid is evaporated into the expansion cylinder, still larger increases may be achieved under quite reasonable operating conditions. Successful application of this principle makes it practicable to operate engines with moderate hot end temperatures and perhaps even with the very low temperatures available from simple nontracking solar collectors. DOE

**N83-23611#** California Univ., Livermore. Lawrence Livermore Lab.
**BELLOWS-WELDING STUDY**
G. E. Faulkner and C. N. Westrich 8 Nov. 1982 29 p refs
(Contract W-7405-eng-48)
(DE83-003056; UCID-19600) Avail: NTIS HC A03/MF A01

Standing lip welds in circular discs of 0.005 in. thick type 304L stainless steel were gas tungsten arc welded to investigate low fatigue life in welded bellows. Eleven variables, such as arc gap, alignment of the tungsten with the weld centerline, mismatch, etc., which are encountered in production welding, were simulated to study their effects on weld penetration. Weld current and arc voltage were monitored to determine if they were sensitive to variables that resulted in unacceptable weld penetration. The study was performed to minimize random variables. Precision chills were used to obtain uniform weld chill. A jewelers lathe was used to provide weld travel. A live center in the tail stock of the lathe was used to apply chill pressure. A microscope was used to align the tungsten electrode with the joint and to observe the weld. A welding power source, with precise control of welding current was used. Discs were deburred. Eight cross sections were examined to measure weld penetration. Weld penetration values varied considerably within individual welds. Minimum values were 25 to 50% lower than maximum values. DOE

**N83-23612#** Stone and Webster Engineering Corp., Boston, Mass.
**VALVE-STEM-PACKING IMPROVEMENT STUDY Final Report**
C. W. Adey and J. J. Klein EPRI Aug. 1982 136 p refs Sponsored by EPRI
(EPRI Proj. 1623-1)
(DE82-906464; EPRI-NP-2560) Avail: NTIS HC A07/MF A01

An understanding of valve stem packing leakage problems was developed. Specific recommendations for valve manufacturers, valve packing manufacturer, and nuclear plant valve users were developed. It is recommended that each group make better use of graphite packing. It is indicated that increased usage of graphite packing over the last few years has reduced the incidence of valve packing problems. A statistical analysis of the LER data confirms that the adoption of graphite packing gives significantly reduced valve stem leakage. DOE

**N83-23613#** Franklin Research Center, Philadelphia, Pa.
**FEED-PUMP HYDRAULIC PERFORMANCE AND DESIGN IMPROVEMENT, VOLUME 2 Final Report**
J. D. Dunfee, I. M. Anwar, V. Rusak, J. A. Silvaggio, Jr., and H. Spring Mar. 1982 147 p refs Sponsored by EPRI Prepared in cooperation with Transamerica Delaval, Inc.
(EPRI Proj. 1884-5)
(DE82-903306; EPRI-CS-2322-Vol-2) Avail: NTIS HC A07/MF A01

As a result of surveys of the industry and the literature, which are described, a research plan is presented that is designed to improve the reliability of boiler feed pumps, which are a key factor in power plant availability. The research tasks can be divided into three major categories: studies of flow phenomena in the pump, improvement of mechanical components supporting and sealing the rotor, and utility aids designed to offer immediate help to the utilities in areas of pump specification, procurement, maintenance, and reliability. A method is presented of estimating the anticipated payback versus estimated research costs. DOE

**N83-23614#** Westinghouse Electric Corp., Pittsburgh, Pa. Advanced Energy Systems Div.
**REMOTE AUTOMATIC PLASMA ARC-CLOSURE WELDING OF A DRY-STORAGE CANISTER FOR SPENT NUCLEAR FUEL AND HIGH-LEVEL RADIOACTIVE WASTE**
R. P. Sprecace and W. P. Blankenship 1982 48 p refs Presented at the Intern. Conf. on Welding Technol. for Energy Appl., Gatlinburg, Tenn., 16 May 1982
(Contract DE-AC08-81NV-10171)
(DE82-013963; CONF-820544-1) Avail: NTIS HC A03/MF A01

A carbon steel storage canister was designed for the dry encapsulation of spent nuclear fuel assemblies or of logs of vitrified high level radioactive waste. The canister design is in conformance with the requirements of the ASME Code, Section III, Division 1 for a Class 3 vessel. The canisters will be loaded and sealed as part of a completely remote process sequence to be performed in the hot bay of an experimental encapsulation facility. The final closure to be made is a full penetration butt weld between the canister body, a 12.75 in O.D. x 0.25 in wall pipe, and a mating semi-ellipsoidal cloaure lid. Due to a combination of design, application and facility constraints, the closure weld must be made in the 2G position (canister vertical). The plasma arc welding system and the final welding procedure are described. DOE

**N83-23615#** California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
**EFFECTS OF WELDING ON WELDMENT MECHANICAL PERFORMANCE IN 2 AUSTENITIC STEELS M.S. Thesis**
Michael J. Strum Jun. 1982 76 p refs
(Contract DE-AC03-76SF-00098)
(DE83-001400; LBL-14750) Avail: NTIS HC A07/MF A01

The effect of autogenous gas tungsten arc welding on the mechanical performance of two austenitic steels was evaluated for cable jackets of force cooled superconductor coils. The original candidate material was Nitronic 40, a nitrogen strengthened stainless steel. The in-situ reaction heat treatment at 700 C necessary for the formation of the superconducting A15 phase results in severe degradation of the cryogenic tensile ductility in the weld metal. The search for an alternate material led to JBK-75, a modified A286 type gamma prime precipitation hardening iron based superalloy. Observations of a tensile strength mismatch between base metal and the weaker weld metal in JBK-75 prompted a study into the aging response in weldments of this alloy. Localized strain through slip step traces show an easy path of deformation within the solidification structure. Weldment strength varies with grain size. It was found that through post-weld annealing treatments at 950 C, prior to aging, weldment hardness levels can be matched. DOE

**N83-23616#** Northern Research and Engineering Corp., Woburn, Mass.
**RIT PRE-SHIPMENT CHECK-OUT TEST REPORT**
R. E. Lord, R. D. Gryzbinski, and R. M. Sexton 31 Aug. 1982 11 p
(Contract DE-AC03-79ET-15426)
(DE83-000056; DOE/ET-15426/T24) Avail: NTIS

HC A02/MF A01

The radial inflow turbine (RIT) unit was successfully air run up to 26,000 rpm under no load to check unit and system operation prior to shipment to Terry Corporation. Results were all nominal; no anomalies were uncovered. Recommendations are included which deal with minimum shaft loading during idle and the avoidance of condensate in the flow path. DOE

**N83-23617#** Pacific Northwest Lab., Richland, Wash. Materials Dept.

**WHAT MAKES AN ELECTRIC WELDING ARC PERFORM ITS REQUIRED FUNCTION**

Thomas B. Correy Sep. 1982 202 p refs Presented at the IEEE Am. Welding Soc. Meeting, Detroit, 24-28 Apr. 1967

(Contract DE-AC06-76RL-01830)

(DE83-000542; PNL-4341) Avail: NTIS HC A10/MF A01

The physics of direct current and alternating current welding arcs, the heat transfer of direct current welding arcs, the characteristics of dc welding and ac welding power supplies and recommendations for the procurement and maintenance of precision power supplies are discussed. DOE

**N83-23618#** General Electric Co., Schenectady, N. Y. Corporate Research and Development Dept.

**CONDENSATION IN STEAM TURBINES Final Report**

R. A. Kantola Aug. 1982 100 p refs Sponsored by EPRI

(EPRI Proj. 735-1)

(DE82-906486; EPRI-CS-2528) Avail: NTIS HC A05/MF A01

Research concentrated on the condensation of steam in turbines, where the moisture-induced efficiency losses and possibilities of erosion damage impose a lower limit on the expansion of the steam so that no more than a 10 to 12% moisture content is reached. In order to accurately assess and reduce the mechanical and thermodynamic losses (which can be as high as 4 to 8 percentage points of efficiency), the thermodynamic conditions at nucleation onset and the kinetics of the subsequent droplet growth must be accurately known. To overcome objections to prior data, a subsonic technique for investigating steam condensation was developed which uses a nonsteady expansion wave to provide a controlled but rapid expansion of slightly superheated steam. An optical measurement system uses the attenuation of laser light at two wavelengths to determine the droplet size and number density time histories. Fast response pressure transducers are used to determine the steam pressure during this transient test. Through the use of high speed digital recorders to capture the data, an accurate determination of the thermodynamic conditions at onset as well as a detailed description of the droplet growth kinetics was obtained. The basic issue of what mechanism controls droplet growth rate is raised. DOE

**N83-23619#** Los Alamos Scientific Lab., N. Mex.

**DRILL-PIPE SEVERING TOOL WITH HIGH-TEMPERATURE EXPLOSIVE**

Steven P. Koczan, William W. Patterson, and Richard H. Rochester Aug. 1982 12 p refs

(Contract W-7405-eng-36)

(DE82-021839; LA-9483-MS) Avail: NTIS HC A02/MF A01

A special purpose borehole explosive tool designed to meet a need of the hot dry rock (HDR) geothermal energy development program is described. The tool's purpose is to sever stuck drill pipe in deep (> 4500 m), hot (> 320 C), water filled wellbores. No commercial severing tools are known which can be operated at temperatures above 260 C. DOE

**N83-23474#** Cooper Energy Services, Springfield, Ohio.

**NEW ENGINE TECHNOLOGY**

Gerald L. Boner *In* DOE Fuels/Eng. Interface Res. Jul. 1982 p 44-51 (For primary document see N83-23470 13-28)

Avail: NTIS HC A05/MF A01

# 38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

**N83-23620*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

**ULTRASONIC RANKING OF TOUGHNESS OF TUNGSTEN CARBIDE**

Alex Vary and David R. Hull Apr. 1983 11 p refs Presented at the 14th Symp. on Nondestructive Evaluation, San Antonio, Tex., 19-21 Apr. 1983

(NASA-TM-83358; E-1619; NAS 1.15:83358) Avail: NTIS HC A02/MF A01 CSCL 14D

The feasibility of using ultrasonic attenuation measurements to rank tungsten carbide alloys according to their fracture toughness was demonstrated. Six samples of cobalt-cemented tungsten carbide (WC-Co) were examined. These varied in cobalt content from approximately 2 to 16 weight percent. The toughness generally increased with increasing cobalt content. Toughness was first determined by the Palmqvist and short rod fracture toughness tests. Subsequently, ultrasonic attenuation measurements were correlated with both these mechanical test methods. It is shown that there is a strong increase in ultrasonic attenuation corresponding to increased toughness of the WC-Co alloys. A correlation between attenuation and toughness exists for a wide range of ultrasonic frequencies. However, the best correlation for the WC-Co alloys occurs when the attenuation coefficient measured in the vicinity of 100 megahertz is compared with toughness as determined by the Palmqvist technique. Author

**N83-23621#** Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).

**THE DROP PICTURE METHOD AND ITS USE IN QUALITY CONTROL OF WATER AND OTHER LIQUID NUTRIMENTS**

Peter E. M. Schneider Oct. 1982 41 p refs

(MPIS-13/1982; ISSN-0436-1199) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 10,35

Instability caused by a drop falling into a liquid layer is examined. This instability leads to a drop picture based on about 10 local and global movement qualities of the vortex flow. If there is glycerin in the mixture, which constitutes the fluid layer, the drop picture can be visualized by the Schlieren method. The drop picture method gives a synthetic survey of how a substance in the fluid layer modifies the vortex ring metamorphosis. The content of the fluid layer is determined by physico-chemistry analysis. A classification of the drop pictures based on the hydrodynamics of vortex ring instability is developed. This classification allows the interpretation of the drop pictures with the form and movement processes in mind. These factors may determine new criteria for food quality. E.A.K.

**N83-23622#** Fraunhofer-Inst. fuer Informations- und Datenverarbeitung, Karlsruhe (West Germany).

**OBJECTIVE ACOUSTIC QUALITY INSPECTION OF COMPLEX MACHINES. EXEMPLARY INVESTIGATION FOR A COMBUSTION ENGINE Final Report, Aug. 1980**

Heinz-Erhard Meier and Dieter Frey Bonn Bundesministerium fuer Forschung und Technologie Nov. 1982 84 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-HA-82-046; ISSN-0171-7618) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 18

Acoustic quality inspection which recognizes damaged components and manufacturing defects by their characteristic noise and vibration is discussed. Partial automation reduces the effect of noise on the inspectors and at the same time increase the reliability of inspection. Partial automation was investigated for a combustion engine. Vibration signals are recorded for typical fault classes. Wrong tension of timing chain and faulty grinding of camshaft

characteristic signal properties for the classes wrong valve clearance are found by application of signal analysis methods. The measured data allow the recognition of wrong valve clearance. E.A.K.

**N83-23623#** Centro Informazioni Studi Esperienze, Milan (Italy). Documentation Service.
**SOME ASPECTS OF THE INTERACTION BETWEEN NEW NON-DESTRUCTIVE TESTING TECHNIQUES AND INDUSTRIAL PROBLEMS**
F. Tonolini and G. Nardoni (ATB, Brescia, Italy) 1982 14 p refs Presented at 10th World Conf. on Non-Destructive Testing, Moscow, 23-27 Aug. 1982
(CISE-1941) Avail: NTIS HC A02/MF A01

The main aspects of the interface between NDT methodologies and industry are investigated and receptivity and didactis problems enhanced. As an example, only some nonconventional NDT methods as acoustic emission and ultrasonic signal processing techniques are considered. Their application in some significant industrial workshop tests are also described. S.L.

**N83-23624#** California Univ., Berkeley. Operations Research Center.
**SYSTEM RELIABILITY ANALYSIS: FOUNDATIONS**
Richard E. Barlow Jul. 1982 26 p refs
(Contract DAAG29-81-K-0160)
(AD-A123055; ORC-82-8) Avail: NTIS HC A03/MF A01 CSCL 09/3

The purpose of a system reliability analysis is to acquire information about a system of interest relative to making decisions based on considerations of availability, reliability, and safety as well as any inherent engineering risks. The philosophy and guidelines for a system analysis have been discussed in several excellent introductory chapters by David Haasl in a Fault Tree Handbook (1981). Broadly speaking, there are two important aspects to a system analysis: (1) an INDUCTIVE ANALYSIS stage and (2) A DEDUCTIVE ANALYSIS stage. In the inductive analysis stage we gather and organize available information on the system. GRA

**N83-23625#** Fluor Engineers and Constructors, Inc., Irvine, Calif.
**COMPONENT FAILURE AND REPAIR DATA: GASIFICATION-COMBINED-CYCLE POWER-GENERATION UNITS**
R. P. Dawkins and J. A. Derdiger Feb. 1982 156 p
(EPRI Proj. 239-2)
(DE82-902081; EPRI-AP-2205) Avail: NTIS HC A08/MF A01

Failure rates and average restore times are presented for generic types of equipment for a coal gasification combined cycle power generation plant. These were developed using published EEI data, a failure modes analysis procedure, and expert consensus method. The material was developed for use as input in assessing the reliability, availability, critical parts, and sensitivity to failure rates and repair time of a representative plant. These data are published separately because they present a complete and probably unique data set which it is believed will be found useful by other evaluators of such plants or subsystems. DOE

**N83-23626#** Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
**TECHNICAL PLAN FOR DEVELOPMENT OF NONDESTRUCTIVE EXAMINATION TECHNOLOGY**
James R. Bishoff Mar. 1982 23 p refs
(Contract DE-AC07-76ID-13808)
(DE82-013808; EGG-WM-5815) Avail: NTIS HC A02/MF A01

Approximately 104,000 55 gallon drums, 7000 112 cu ft. wooden boxes, and 500 steel bins were stored. These containers are filled with TRU contaminated material ranging from dry paper and rags to large steel machinery. The method for managing the stored waste is to stack the containers in individual cells covered with a layer of plywood, plastic sheeting, and about two feet of soil. This practice will continue until the Stored Waste Experimental Pilot Plant (SWEPP) becomes operational. The SWEPP will certify the stored waste for shipment to the Waste Isolation Pilot Plant (WIPP). The waste and the waste container will be certified to be in compliance with WIPP waste acceptance criteria (WAC). In order to certify the waste, the containers will be weighed, examined nondestructively be X-ray and (possibly) neutron radiography to identify acceptable waste forms, checked by ultrasonic or eddy-current techniques to see that the container is still sound, and assayed to determine the amount of fissile material in the container and its thermal power density. DOE

# 39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance.*

**N83-23627#** Polish Academy of Sciences, Warsaw.
**SYSTEM IDENTIFICATION IN STRUCTURAL MECHANICS: A SURVEY**
Krzysztof Podolak 1982 45 p refs
(ISSN-0208-5658) Avail: Issuing Activity

The applicability of system identification to material characterization purposes is discussed. In material constants for anisotropic, linear elastic body in a plane stress state are determined. A model describing a nonlinear elastic behaviour of rubber-like materials is considered. The designing of metal working machines is examined. A useful procedure for testing and inspection of an actual concrete dam was developed. A brief review of some methods for model structure testing is presented. Questions related to biomechanics, such as formulation of phenomenological models of processes occuring in living systems are studied. A term of structural indentification was introduced in a review of literature. Author

**N83-23628#** Polish Academy of Sciences, Warsaw.
**RIGID-PLASTIC PLATE UNDER CONCENTRATED MOVING LOAD**
Joanna Sokol-Supel (Institute of Fundamental Research, Warsaw, Poland) 1982 24 p refs
(ISSN-0208-5658) Avail: Issuing Activity

The dynamic response of structures subjected to moving loads was considered. For quasi-static loadings of structures it appears that, the design criterion requiring the stresses in the structure which do not exceed the yield value anywhere, is not economical. A more rational approach is needed, utilizing the fact that the material of the structure is elasto-plastics. The general dynamic elasto-plastic analysis is particularly difficult, but by ignoring the elastic deformation, the rigid plastic problem is solved easily, although it is necessary to place restrictions on applications of the solutions to engineering materials. The yield line method is applied to the problem of a rigid-plastic plate subjected to a moving transverse load which is too large for the plate to support under static conditions. Author

**N83-23629*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio. Dept. of Aerospace Mechanics.
**A TOTAL LIFE PREDICTION MODEL FOR STRESS CONCENTRATION SITES Semiannual Engineering Technical Report, 1 Sep. 1982 - 31 Mar. 1983**
George A. Hartman and D. S. Dawicke 11 Apr. 1983 370 p refs
(Grant NAG3-246)
(NASA-CR-170290; NAS 1.26:170290; UDR-TR-83-57; SATR-2) Avail: NTIS HC A16/MF A01 CSCL 20K

Fatigue crack growth tests were performed on center crack panels and radial crack hole samples. The data were reduced and correlated with the elastic parameter-K taking into account finite width and corner crack corrections. The anomalous behavior normally associated with short cracks was not observed. Total life

estimates for notches were made by coupling an initiation life estimate with a propagation life estimate. E.A.K.

**N83-23630*#** Lehigh Univ., Bethlehem, Pa.
**VISCOELASTIC STUDY OF AN ADHESIVELY BONDED JOINT**
Paul F. Joseph Apr. 1983 139 p refs
(Grant NGR-39-007-011)
(NASA-CR-170283; NAS 1.26:170283) Avail: NTIS HC A07/MF A01 CSCL 20K

The plane strain problem of two dissimilar orthotropic plates bonded with an isotropic, linearly viscoelastic adhesive is considered. Both the shear and the normal stresses in the adhesive are calculated for various geometries and loading conditions. Transverse shear deformations of the adherends are taken into account, and their effect on the solution is shown in the results. All three inplane strains of the adhesive are included. Attention is given to the effect of temperature, both in the adhesive joint problem and to the heat generation in a viscoelastic material under cyclic loading. This separate study is included because heat generation and or spatially varying temperature are at present too difficult to account for in the analytical solution of the bonded joint, but whose effect can not be ignored in design. S.L.

**N83-23631*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
**ARRAY STRUCTURE DESIGN HANDBOOK FOR STAND ALONE PHOTOVOLTAIC APPLICATIONS**
Robert C. Didelot Oct. 1980 243 p refs
(Contract DE-AI01-79ET-20485)
(NASA-TM-82629; E-882; NAS 1.15:82629; DOE/NASA/20485-2) Avail: NTIS HC A11/MF A01 CSCL 20K

This handbook will permit the user to design a low-cost structure for a variety of photovoltaic system applications under 10 kW. Any presently commercially available photovoltaic modules may be used. Design alternatives are provided for different generic structure types, structural materials, and electric interfaces. The use of a hand-held calculator is sufficient to perform the necessary calculations for the array designs. Author

**N83-23632#** National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.
**THE TAIL OF THE TEST SPECTRUM. THE EFFECT OF DIFFERENT APPROXIMATIONS OF THE LOWER END OF A GUST LOAD SPECTRUM ON CRACK GROWTH AND FATIGUE LIFE IN 7075-T6 AND 2024-T3 SPECIMENS**
A. Nederveen and J. B. deJonge Jun. 1981 46 p refs Original contains color illustrations
(Contracts RB-RLD-80-024; NIVR-1822)
(NLR-TR-81071-U) Avail: NTIS HC A03/MF A01

The influence of the approximation of the lower end of the load spectrum was investigated by comparative tests. The Basic F-27 test program and an extended version, containing three times more cycles per flight were used. Crack growth was studied on notched sheet specimens made of Alclad 2024-T3 and Alclad 7075-T6. Fatigue life was tested on riveted specimens made of these same materials. The 2024-T3 series includes specimens that are dry riveted and specimens that are wet riveted. E.A.K.

**N83-23633#** National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.
**LIFETIME PREDICTION METHODS FOR CORNER CRACKS AT HOLES**
C. J. Lof 30 Jun. 1981 71 p refs
(Contract NIVR-1776)
(NLR-TR-81077-U) Avail: NTIS HC A04/MF A01

An application of linear elastic fracture mechanics to 3-dimensional crack growth prediction was developed in two phases. In the first phase finite element techniques for accurate stress intensity (S.I.) calculation were evaluated. The process of corner flaw growth during constant amplitude fatigue load was studied. The development of cracks in size and shape as a function of calculated instantaneous S.I. distributions along the crack boundary was investigated. Lifetime predictions concerning critical crack size are made. E.A.K.

**N83-23634#** Royal Inst. of Tech., Stockholm (Sweden). Dept. of Strength of Materials and Solid Mechanics.
**ON THE RELATION BETWEEN STABLE CRACK GROWTH AND FATIGUE**
Sten Kaiser 1933 33 p refs Sponsored by Swedish Authority for Technical Development and Swedish Authority for Nuclear Inspection
(TRITA-HFL-0035; Publ-215; ISSN-0349-1234) Avail: NTIS HC A03/MF A01

Crack growth under cyclic loading is described by Paris Law. If plastic deformation is involved, however, the crack growth rate is often underestimated. The increased crack growth rate due to the plastic deformation is determined by using the J-R curve was studied. A way to predict instability under controlled cyclic load and instability under displacement control are discussed. E.A.K.

**N83-23635#** Royal Inst. of Tech., Stockholm (Sweden). Dept. of Strength of Materials and Solid Mechanics.
**ON THE POSSIBILITY OF PREDICTING FAILURE OF CRACKED COMPONENTS UNDER BENDING**
Sten Kaiser Nov. 1982 39 p refs
(Grant STU-80-3850)
(TRITA-HFL-0036; Publ-216; ISSN-0349-1234) Avail: NTIS HC A03/MF A01

Six different methods to predict failure of cracked ductile components under load control are compared. The methods are: limit load analysis; two versions of the failure assessment diagram; the tearing modulus, the EPRI estimation scheme and a method based on the key curve. Three different methods, a combination of key curve and tearing modulus, the M-theta sub c relation and the limit load version of T, are compared under displacement control. The influence of crack length and specimen length on instability is studied. The key curve is used to derive a failure assessment diagram for bending geometries which includes deformation hardening. The key curve method is also used to study the influence of strain hardening, tearing modulus and fracture toughness on the failure load. E.A.K.

**N83-23636*#** Texas A&M Univ., College Station. Dept. of Aerospace Engineering.
**DEVELOPMENT AND EVALUATION OF UNCOUPLED, INCREMENTAL CONSTITUTIVE MODEL FOR ELASTIC-PLASTIC-CREEP BEHAVIOR AT ELEVATED TEMPERATURES Final Technical Report**
Jeff Cronenworth and Walter E. Haisler May 1982 87 p refs
(Contract N00014-76-C-0150; NR Proj. 064-534)
(NASA-CR-170155; NAS 1.26:170155; AD-A123035; TR-3275-82-1) Avail: NTIS HC A05/MF A01 CSCL 20/11

The purpose of this research is to extend the classical incremental theory of plasticity to develop and evaluate the uniaxial constitutive relations necessary to model the nonlinear behavior of crystalline materials experiencing thermoelastic-plastic-creep. Among the requirements for a sound constitutive theory for the media mentioned above are that it incorporate the ability to model transient temperature response; cyclic behavior including cyclic saturation, the change in strain hardening upon stress reversal, and the Bauschinger effect; and rate dependence. In fulfillment of these objectives, this thesis will proceed in the following manner. First, a brief literature review of the available theories is presented along with a discussion of the details of the constitutive model used in this research. Next, the development of the model is accomplished by derivation of the uniaxial theory including experimental data requirements and computational considerations. Several theoretical examples are presented along with comparison to experiments on several different metals at elevated temperature. GRA

**N83-23637#** Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
**DYNAMIC ANALYSIS OF A STRUCTURE WITH COULOMB**

**FRICTION**

V. N. Shah and C. B. Gilmore (Westinghouse Electric Corp., Pittsburgh) 1982 10 p refs Presented at the ASME Pressure Vessel and Piping Conf., Orlando, Fla., 27 Jun. 1982
(Contract DE-AC07-76ID-01570)
(DE82-019231; EGG-M-10981; CONF-820601-20) Avail: NTIS HC A02/MF A01

A modal superposition method for the dynamic analysis of a structure with Coulomb friction is presented. The finite element method is used to derive the equations of motion, and the nonlinearities due to friction are represented by pseudo force vector. A structure standing freely on the ground may slide during a seismic event. The relative displacement response may be divided into two parts: elastic deformation and rigid body motion. The presence of rigid body motion necessitates the inclusion of the higher modes in the transient analysis. Three single degree of freedom problems are solved to verify this method. In a fourth problem, the dynamic response of a platform standing freely on the ground is analyzed during a seismic event. DOE

**N83-23638#** General Electric Co., San Jose, Calif. Nuclear Engineering Div.

**GROWTH AND STABILITY OF STRESS CORROSION CRACKS IN LARGE DIAMETER BWR PIPING. VOLUME 2: APPENDIXES Final Report**

D. A. Hale, J. D. Heald, R. M. Horn, C. W. Jewett, J. N. Kass, H. S. Mehta, S. Ranganath, and S. R. Sharma Jul. 1982 379 p refs Sponsored by Electric Power Research Inst.
(DE82-905835; EPRI-NP-2472-Vol-2) Avail: NTIS HC A17/MF A01

The net section collapse criterion was applied to assess quantitatively the margin to failure for Boiling Water Reactor (BWR) pipes and safe ends containing part through and through wall circumferential cracks, subjected to combinations of membrane and bending stresses expected under normal operation condition. Calculations were performed for Type 304 stainless steel and Inconel, and the results are plotted in the form of failure analysis diagrams. Various crack shapes are considered in the analysis and the analytical predictions are compared with field and experimental data. Failure analysis diagrams for Type 304 stainless steel and Inconel indicate substantial margins to failure in pipes and piping components under normal conditions. Consideration of realistic crack shapes in the analysis shows additional safety margin in field pipe cracks. Experimental and field data are consistent with analytical predictions. Comparison with predictions from elastoplastic fracture mechanics estimating scheme shows good agreement. DOE

**N83-23639#** General Electric Co., San Jose, Calif. Nuclear Engineering Div.

**GROWTH AND STABILITY OF STRESS CORROSION CRACKS IN LARGE-DIAMETER BWR PIPING. VOLUME 1: SUMMARY Final Report**

D. A. Hale, J. D. Heald, R. M. Horn, C. W. Jewett, J. N. Kass, H. S. Mehta, S. Ranganath, and S. R. Sharma Jul. 1982 45 p refs Sponsored by Electric Power Research Inst.
(EPRI Proj. T118-1)
(DE82-906435; EPRI-NP-2472-SY-Vol-1) Avail: NTIS HC A03/MF A01

The behavior of hypothetical stress corrosion cracks in large diameter austenitic piping was evaluated. A design margin assessment, an evaluation of crack growth and crack arrest, and development of a predictive model were included. As part of the margin assessment, diagrams were developed, which predicted net section collapse as a function of crack size. In addition, plasticity and dynamic load effects were also considered in evaluating collapse. Analytical methods for evaluating these effects were developed and were benchmarked by dynamic tests of 4 in. diameter piping. The task of evaluating the growth behavior of stress corrosion cracks focused on developing constant load and cyclic growth rate data that could be used with the predictive model. Secondly, laboratory tests were performed to evaluate the conditions under which growing stress corrosion cracks would arrest when they intersected stress corrosion resistant weld metal. DOE

**N83-23640#** California Univ., Livermore. Lawrence Livermore Lab.

**INVERSE PROBLEM IN VISCOELASTICITY**

Lewis Thigpen, Gerald W. Hedstrom, and Brian P. Bonner Aug. 1982 8 p refs Presented at the Rev. of Progr. in Quantitative NDE, San Diego, Calif., 1 Aug. 1982
(Contract W-7405-eng-48)
(DE82-021927; UCRL-87601; CONF-820820-3) Avail: NTIS HC A02/MF A01

Calculation of attenuation and dispersion spectra for a general anelastic body which may be posed as an inversion problem is discussed. The time dependent strain due to instantaneous changes in stress in order to characterize the anelastic response is observed. This experimental technique reaches a range of frequencies which is lower than that used in resonance bar experiments, but makes only indirect measurement of the viscoelastic properties. The most general anelastic model which states that the observed compliance is due to the summed effect of an arbitary spectrum of mechanisms is employed. The analysis requires the solution of Fredholm integral equations of the first kind. Bulter's method of constrained regularization which takes advantage of the fact that the solution is positive and uses data dependent smoothing is employed. It is indicated that the imposition of the positivity constraint makes the computation of the solution much better conditioned. DOE

**N83-23641#** National Oceanic and Atmospheric Administration, Boulder, Colo. Wave Propagation Lab.

**LIDAR MEASUREMENT OF WIND VELOCITY TURBULENCE SPECTRA ENCOUNTERED BY A ROTATING TURBINE BLADE**

R. M. Hardesty, J. A. Korrell, and F. F. Hall 1982 25 p refs
(Contract DE-AI06-80RL-0236)
(DE82-020966; DOE/RL-10236-81/1) Avail: NTIS HC A02/MF A01

A homodyne CO2 lidar system beam was conically scanned around a horizontal axis to measure the wind speed and turbulence characteristics encountered by a rotating turbine blade. Turbulence spectra obtained from the scanning lidar differed considerably from those calculated from fixed point anemometer measurements, showing a redistribution of energy from lower to higher frequencies. The differences appeared more pronounced during periods when the atmosphere was stable. DOE

**N83-23642#** Sandia Labs., Albuquerque, N. Mex. Applied Mechanics Div.

**USE OF LABORATORY TRIAXIAL-CREEP DATA AND FINITE-ELEMENT ANALYSIS TO PREDICT OBSERVED CREEP BEHAVIOR OF LEACHED SALT CAVERNS**

Dale S. Preece and Charles M. Stone Aug. 1982 33 p refs
(Contract DE-AC04-76DP-00789)
(DE82-022235; SAND-82-0678) Avail: NTIS HC A03/MF A01

The use of leached salt caverns to store oil and natural gas was examined. A critical factor in the use of existing caverns and the design of new ones is the creep behavior of the salt surrounding the caverns. Laboratory triaxial creep data as material property input to finite element computer programs designed to calculate displacements and stresses due to creep are used. A step in verifying these predictive methods is the comparison of field data from existing caverns with finite element analyses which incorporate the material properties and geometry of each site. This comparison has been made for caverns in the Eminence Dome (Mississippi), West Hackberry Dome (Louisiana), and Bayour Chocktaw dome (Louisiana) and reasonably good correlation is obtained between measured and predicted volumetric response of the caverns. DOE

**N83-23643#** Central Inst. for Industrial Research, Oslo (Norway). Electronics Div.

**CRACK DETECTION BY THE FIELD SIGNATURE METHOD. INVITATION TO PARTICIPATE: DEVELOPMENT OF A NEW METHOD FOR MONITORING CRACK FORMATION IN OFF-**

**SHORE STRUCTURES**
Harek Hognestad 14 Sep. 1982 24 p Sponsored in part by the Royal Norwegian Council for Scientific Industrial Research
(PB83-135541; ISBN-82-7267-483-1; Rept-82-08-06-1) Avail: NTIS HC A02/MF A01 CSCL 13M

The proposed method for discovering cracks and monitoring their growth in offshore steel structures is based on measurements of the electrical field set up in the structure by an impressed electric current - a version of the potential drop technique. Sufficient evidence is obtained to state that the concept represents a promising method for structural monitoring of mobile rigs and jacket platforms. GRA

**N83-23644#** Iowa Univ., Iowa City. Computer-Aided Engineering Instructional Lab.
**OPTIMAL STRUCTURAL DESIGN THROUGH BOUNDING TECHNIQUES Ph.D. Thesis**
S. V. Belsare and Jasbir S. Arora Jun. 1982 267 p refs
(Grant NSF CEE-80-08102)
(PB83-126672; CAD-SS-82-4) Avail: NTIS HC A12/MF A01 CSCL 20K

The concept of upper and lower bounds on the optimum cost to develop optimization algorithms is presented. The basic idea is to first establish bounds on the optimum cost. The design space between the bounds is then systematically searched to establish better bounds on the optimum cost until optimality conditions are satisfied. Two computational schemes that facilitate the systematic search procedure are developed and examined. The first one is an extension of the gradient projection method. In the second scheme, four quadratic programming problems are introduced. Each quadratic problem is designed to execute a well defined step in the design space. In both schemes a concept of 'Constant Cost Step' is introduced. This concept is central to the systematic search procedure. GRA

**N83-23645#** Iowa Univ., Iowa City. Computer-Aided Engineering Instructional Lab.
**A STUDY OF MATHEMATICAL PROGRAMMING METHODS FOR STRUCTURAL OPTIMIZATION Ph.D. Thesis**
Ashok D. Belegundu and Jasbir S. Arora Aug. 1982 365 p refs
(Grant NSF CEE-80-08102)
(PB83-131029; CAD-SS-82-5) Avail: NTIS HC A16/MF A01 CSCL 20K

Various mathematical programming methods for optimal design of structural systems are studied. The most reliable and accurate method, improving existing methods, and the strengths and weaknesses of different methods are identified. Many special features which have the structural optimization problem have helped to form the basis of the study. The main features with the structural design problem are the presence of implicit functions, generality, presence of multiple local minima, large size and the cost associated with function and gradient evaluations. GRA

**N83-23646#** Centre de Recherches Scientifiques et Techniques de l'Industrie des Fabrications Metalliques, Brussels (Belgium).
**RELATION BETWEEN WELDING PARAMETERS OF A BEAM SECTION AND ITS BUCKLING STRENGTH**
A. Plumier Sep. 1982 43 p refs Transl. into ENGLISH of the book "Relation Entre les Parametres de Soudage d'une Colonne et sa Charge de Flambement" Belgium, Apr. 1981 43 p
(PB83-107771; CRIF-MT-143) Avail: NTIS HC A03/MF A01 CSCL 13M

Standardized curves for the calculation of buckling strength were questioned. These curves pertain to different structural members. It is demonstrated that for certain fabrication conditions, i.e., manual welding, particularly of I-beams, these dimensioning curves give unreliable specifications. The analytical determination of the residual stress distribution in a welded I beam is considered. Thin and thick welded plates are dealt with. The method is applied to arrive at parametrical results for the buckling strength of welded sections, allowing the real safety factor to be determined for the defined distribution of welding parameters and cross sections. Complete relations for the calculation of residual stress in various structural profiles are shown. GRA

# 42 GEOSCIENCES (GENERAL)

**N83-23647*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
**RESEARCH REVIEW, 1982: GLOBAL MODELING AND SIMULATION BRANCH LABORATORY FOR ATMOSPHERIC SCIENCES**
Jan. 1983 198 p refs
(NASA-TM-84983; NAS 1.15:84983) Avail: NTIS HC A09/MF A01 CSCL 04A

Papers on the atmospheric, climatological, and oceanographic research are compiled. Global weather/observing systems and climate/ocean-air interactions are reviewed. Author

**N83-23648#** Department of Energy, Washington, D. C. Office of Energy Research.
**SUMMARIES OF PHYSICAL RESEARCH IN THE GEOSCIENCES**
Sep. 1982 116 p refs
(DE82-021887; DOE/ER-0145) Avail: NTIS HC A06/MF A01

The scope of the individual research programs in geosciences are described. The geosciences research program includes research in geology, petrology, geophysics, geochemistry, hydrology, solar-terrestrial relationships, aeronomy, seismology, and natural resource analysis, including the various subdivisions and interdisciplinary areas. DOE

# 43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography.*

**N83-23649*#** Rochester Inst. of Tech., N. Y. School of Photographic Arts and Sciences.
**LANDSAT-4 BAND 6 DATA EVALUATION Quarterly Report**
15 Mar. 1983 13 p refs ERTS
(Contract NAS5-27323)
(E83-10244; NASA-CR-170250; NAS 1.26:170250; QR-2) Avail: NTIS HC A02/MF A01 CSCL 05B

The radiometric integrity of the LANDSAT-D thematic mapper (TM) thermal infrared channel (band 6) data was evaluated to develop improved radiometric preprocessing calibration techniques for removal of atmospheric effects. Primary data analysis was spent in evaluating the line to line and detector to detector variation in the thermal infrared data. The data studied was in the core area of Lake Ontario where very stable temperatures were expected. The detectors and the scan direction were taken as separate parameters and an analysis of variance was conducted. The data indicate that significant variability exists both between detectors and between scan directions. M.G.

**N83-23650*#** Maryland Univ., College Park. Remote Sensing Systems Lab.
**SENSITIVITY OF RAINFALL EXCESS TO ANTECEDENT SOIL MOISTURE AND SOIL HYDRAULIC PROPERTIES**
Harold A. Wilkening Oct. 1982 180 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Proj. AgRISTARS)
(E83-10245; NASA-CR-170251; CP-52-04373; NAS 1.26:170251) Avail: NTIS HC A09/MF A01 CSCL 02C

A sensitivity analysis to determine the impact of antecedent soil moisture and soil hydraulic properties on rainfall excess volumes was performed. That the spatial distribution of surface

soil moisture at the beginning of a storm must be correctly defined if physically-based hydrologic models are to properly partition the rainfall into portions that enter the soil and portions that become available for surface runoff. This statement is especially true for those rainfall events that occur on a routine or frequent basis. Thus, the quality of the results of continuous accounting models used to estimate the replenishment of foil moisture storage from rainfall are closely tied to the quality of information on the soil moisture in the surface layers at the beginning of the storm event. M.G.

**N83-23651*#** Massachusetts Inst. of Tech., Cambridge. Research Lab. of Electronics.
**REMOTE SENSING OF VEGETATION AND SOIL MOISTURE Semiannual Report, 1 Sep. 1982 - 28 Feb. 1983**
J. A. Kong and R. T. Shin, Principal Investigators Mar. 1983 7 p ERTS
(Grant NAG5-141)
(E83-10246; NASA-CR-170252; NAS 1.26:170252) Avail: NTIS HC A02/MF A01 CSCL 08M

Progress in the investigation of problems related to the remote sensing of vegetation and soil moisture is reported. Specific topics addressed include: (1) microwave scattering from periodic surfaces using a rigorous modal technique; (2) combined random rough surface and volume scattering effects; (3) the anisotropic effects of vegetation structures; (4) the application of the strong fluctuation theory to the the study of electromagnetic wave scattering from a layer of random discrete scatterers; and (5) the investigation of the scattering of a plane wave obliquely incident on a half space of densely distributed spherical dielectric scatterers using a quantum mechanical potential approach. M.G.

**N83-23652*#** Environmental Research Inst. of Michigan, Ann Arbor. Applications Div.
**DEVELOPMENT AND TESTING OF LANDSAT-ASSISTED PROCEDURES FOR COST-EFFECTIVE FOREST MANAGEMENT Final Report, Apr. - Sep. 1982**
John E. Colwell, Paul A. Sanders, and Fred J. Thomson Sep. 1982 56 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(Contract USDA/FS-53-3187-2-24; Proj. AgRISTARS)
(E83-10247; NASA-CR-170253; RR-E2-04368; NAS 1.26:170253; NFAP-82-308; ERIM-161800-1-F) Avail: NTIS HC A04/MF A01 CSCL 02C

The capability of LANDSAT data to make certain forest management activities on the Clearwater National Forest in Idaho more efficient and/or more effective was examined. One task was designed to evaluate the utility of single-date categorized LANDSAT data as a source of land cover information for use in assessing elk habitat quality. LANDSAT data was used to categorize conifer forest on the basis of the percentage crown closure. This information was used to evaluate elk habitat quality on the basis of the ratio of cover to forage. A preliminary conclusion is that categorized LANDSAT data can be helpful for assessing current elk habitat quality if the relationships between crown closure and hiding cover can be adequately defined. Another task was designed to evaluate the utility of merged two-date LANDSAT data for updating the existing (1972) Clearwater Forest land cover information. LANDSAT data from 1972 and 1981 were merged, and change images were created. These products indicated where major changes were taking place. These areas could then be examined on aerial photography or in the field to further characterize the nature and magnitude of the change. The 1972 land cover information could be subsequently altered in these changed areas, whereas areas with no change would not have to be re-examined. M.G.

**N83-23653*#** GeoScience Research Corp., Salisbury, Md.
**SEASAT RADAR ALTIMETER MEASUREMENTS OVER THE FLORIDA EVERGLADES Final Report**
Ronald L. Brooks and George A. Norcross Wallops Island, Va. NASA. Wallops Flight Center Feb. 1983 28 p refs ERTS
(Contract NAS6-3117)
(E83-10248; NASA-CR-156889; NAS 1.26:156889) Avail: NTIS HC A03/MF A01 CSCL 17I

The SEASAT satellite radar altimeter traversed the Florida Everglades on August 14, 1978. Analysis of the measurements disclosed that the altimeter pulses from 800 km above the Earth's surface penetrated the vegetation canopies to provide land and water surface elevations with accuracies better than + or - 50 cm. The altimeter waveforms required retracking over the specular Everglades surface. The altimeter-derived land elevations were correlated with large-scale topographic maps while the altimeter-derived water elevations were correlated with water gauge records of the U.S. Geological Survey. Examination of the altimeter waveforms also revealed reflections from the Everglades' surface occurring earlier than the surface reflections. These earlier surface reflections are interpreted to be from vegetation canopies, and may provide a measure of vegetation canopy heights. Future satellite radar altimeters could provide supplemental vertical control in relatively inaccessible swamp areas, could monitor water levels, and perhaps could monitor vegetation growth. M.G.

**N83-23654*#** Saint Regis Paper Co., Cantonment, Fla. Southern Timberlands Div.
**FOREST RESOURCE INFORMATION SYSTEM (FRIS) Final Project Report**
1 Feb. 1983 103 p refs ERTS
(E83-10249; NASA-CR-171630; NAS 1.26:171630) Avail: NTIS HC A06/MF A01 CSCL 20F

The technological and economical feasibility of using multispectral digital image data as acquired from the LANDSAT satellites in an ongoing operational forest information system was evaluated. Computer compatible multispectral scanner data secured from the LANDSAT satellites were demonstrated to be a significant contributor to ongoing information systems by providing the added dimensions of synoptic and repeat coverage of the Earth's surface. Major forest cover types of conifer, deciduous, mixed conifer-deciduous and non-forest, were classified well within the bounds of the statistical accuracy of the ground sample. Further, when overlayed with existing maps, the acreage of cover type retains a high level of positional integrity. Maps were digitized by a graphics design system, overlayed and registered onto LANDSAT imagery such that the map data with associated attributes were displayed on the image. Once classified, the analysis results were converted back to map form as a cover type of information. Existing tabular information as represented by inventory is registered geographically to the map base through a vendor provided data management system. The notion of a geographical reference base (map) providing the framework to which imagery and tabular data bases are registered and where each of the three functions of imagery, maps and inventory can be accessed singly or in combination is the very essence of the forest resource information system design. M.G.

**N83-23655*#** Department of Agriculture, Houston, Tex.
**A METEOROLOGICALLY-DRIVEN YIELD REDUCTION MODEL FOR SPRING AND WINTER WHEAT**
F. W. Ravet, W. J. Cremins, T. W. Taylor, P. Ashburn, D. Smika, and A. Aaronson, Principal Investigators Feb. 1983 19 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Proj. AgRISTARS)
(E83-10250; NASA-CR-170254; EW-U3-04397; JSC-18601; NAS 1.26:170254) Avail: NTIS HC A02/MF A01 CSCL 02C

A yield reduction model for spring and winter wheat was developed for large-area crop condition assessment. Reductions are expressed in percentage from a base yield and are calculated on a daily basis. The algorithm contains two integral components: a two-layer soil water budget model and a crop calendar routine. Yield reductions associated with hot, dry winds (Sukhovey) and soil moisture stress are determined. Input variables include evapotranspiration, maximum temperature and precipitation; subsequently crop-stage, available water holding percentage and

stress duration are evaluated. No specific base yield is required and may be selected by the user; however, it may be generally characterized as the maximum likely to be produced commercially at a location. Author

**N83-23656*#** Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
**EVALUATION OF AREAS PREPARED FOR PLANTING USING LANDSAT DATA M.S. Thesis [AVALIACAO DE AREAS PREPARADAS PARA PLANTIO (SOLONU) UTILIZANDO DADOS DO SATELITE LANDSAT]**
Nelson de Jesus Parada, Principal Investigator, Getulio Vargas deAssuncao, and Valdete Duarte Feb. 1983 76 p refs In PORTUGUESE; ENGLISH summary Sponsored by NASA ERTS
(E83-10251; NASA-CR-170255; NAS 1.26:170255;
INPE-2637-TDL/113) Avail: NTIS HC A05/MF A01 CSCL 08B

Three different algorithms (SINGLE-CELL, MAXVER and MEDIA K) were used to automatically interpret data from LANDSAT observations of an area of Ribeirao Preto, Brazil. Photographic transparencies were obtained, projected and visually interpreted. The results show that: (1) the MAXVER algorithm presented a better classification performance; (2) verification of the changes in cultivated areas using data from the three different acquisition dates was possible; (3) the water bodies, degraded lands, urban areas, and fallow fields were frequently mistaken by cultivated soils; and (4) the use of projected photographic transparencies furnished satisfactory results, besides reducing the time spent on the image-100 system. A.R.H.

**N83-23657*#** Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
**ANALYSIS AND CRITICAL ASSESSMENT OF THE CURRENT AND NEAR FUTURE PLANS OF THE BRAZILIAN SATELLITE APPLICATIONS PROGRAM AND ITS ROLE IN THE GLOBAL SPACE PROGRAM**
Nelson de Jesus Parada, Principal Investigator Feb. 1983 17 p Presented at the United Nations Reg. Seminar on Space Appl., Quito, Ecuador, 19-23 Apr. 1982 Sponsored by NASA ERTS
(E83-10252; NASA-CR-170256; NAS 1.26:170256;
INPE-2640-PRE/261) Avail: NTIS HC A02/MF A01 CSCL 05B

Brazilian programs using satellites for remote sensing, meteorology and communications are analyzed including their current status and near future plans. The experience gained and available information are used to critically discuss some aspects of great importance for the existing and prospective user countries. Author

**N83-23658*#** Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
**STORM-TIME CHANGES OF GEOMAGNETIC FIELD AT MAGSAT ALTITUDES (325-550 KM) AND THEIR COMPARISON WITH CHANGES AT GROUND LOCATIONS**
Nelson de Jesus Parada, Principal Investigator, Rajaram Purushottam Kane, and Nalin Babulal Trivedi Mar. 1983 42 p refs Submitted for publication Sponsored by NASA and FNDCT ERTS
(E83-10253; NASA-CR-170257; NAS 1.26:170257;
INPE-2675-PRE/282) Avail: NTIS HC A03/MF A01 CSCL 08G

The values of H, X, Y, Z at MAGSAT altitudes were first expressed as residuals delta H, delta X, delta Y, delta Z after subtracting the model HMD, XMD, YMD, ZMC. The storm-time variations of H showed that delta H (Dusk) was larger (negative) than delta H (Dawn) and occurred earlier, indicating a sort of hysteresis effect. Effects at MAGSAT altitudes were roughly the same (10% accuracy) as at ground, indicating that these effects were mostly of magnetospheric origin. The delta Y component also showed large storm-time changes. The latitudinal distribution of storm-time delta H showed north-south asymmetries varying in nature as the storm progressed. It seems that the central plane of the storm-time magnetospheric ring current undergoes latitudinal meanderings during the course of the storm. Author

**N83-23659*#** New England Innovation Group, Inc., Providence, R.I.
**TWO-WAY COMMUNICATION AND ANALYSIS PROGRAM ON LANDSAT**
[1983] 161 p refs ERTS
(Contract NASw-3443)
(E83-10254; NASA-CR-170258; NAS 1.26:170258) Avail: NTIS HC A08/MF A01 CSCL 17B

Community workshops, field visits, telephone surveys, and other research reveals that professionals at the substate level are interested in and open to consideration of LANDSAT as a planning and resource management tool, but are at the same time skeptical about some of the inherent problems with LANDSAT such as cost, resolution, frequency of coverage, and data continuity. The principal requirements for increasing the utilization of LANDSAT by potential substate users were identified and documented. Without a committment from the Federal Government for increased substrate utilization and the availability of trained professionals to meet the needs of a largely new user community, substrate activity is likely to remain at a minimum. Well conceived and well executed demonstration projects could play a critical role is shaping the technolcgy's ability to be more sensitive to substate user needs and interests as well as validating the effectiveness of this data to a skeptical audience. A.R.H.

**N83-23660*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
**THE SNOWMELT-RUNOFF MODEL (SRM) USER'S MANUAL**
J. Martinec (Swiss Federal Inst. for Snow and Avalanche Research), A. Rango, and E. Major (Research and Data Systems, Inc.) Apr. 1983 120 p refs
(NASA-RP-1100; Rept-83B0251; NAS 1.61:1100) Avail: NTIS HC A06/MF A01 CSCL 08H

A manual to provide a means by which a user may apply the snowmelt runoff model (SRM) unaided is presented. Model structure, conditions of application, and data requirements, including remote sensing, are described. Guidance is given for determining various model variables and parameters. Possible sources of error are discussed and conversion of snowmelt runoff model (SRM) from the simulation mode to the operational forecasting mode is explained. A computer program is presented for running SRM is easily adaptable to most systems used by water resources agencies. E.A.K.

**N83-23661*#** Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.
**C-BAND MEASUREMENTS OF RADAR BACKSCATTER FROM ICE PROJECT SUMMARY REPORT Final Report**
R. G. Onstott and R. K. Moore May 1983 29 p
(Contract NCCI-51)
(NASA-CR-170302; NAS 1.26:170302; RSL-TR-524) Avail: NTIS HC A03/MF A01 CSCL 08L

The ability to measure the radar scattering coefficient of ice with a helicopter or surface spectrometer was extended into the 4-8 GHz spectral region. The scattering coefficient was measured at Mould Bay, N.W.T., over a frequency range from 4 to 18 GHz for both summer and fall conditions. Scatter from fresh water ice in the St. Lawrence River and from numerous seasonal sea-ice types along the coast of Newfoundland were also measured. The C-band (near 5 GHz) scattering cross section for different types of ice shows poorer contrast than the scattering coefficient at higher frequencies, but better contrast than the negligible value found at L-band (1.5 GHz). At frequencies above 4 GHz the contrast in scattering coefficient between the different ice types is much less in summer than in other seasons; at most times of year the scattering is much stronger from multiyear than from other ice types, but in early summer it is actually slightly weaker than that from first year ice. E.A.K.

**N83-23662#** Committee on Energy and Natural Resources (U.S. Senate).
**FEDERAL ENERGY AND MINERAL RESOURCES ACT OF 1982**
Washington GPO 1982 406 p refs Hearings on S. 2305 before the Comm. on Energy and Natural Resources, 97th Congr., 2d Sess., 8 and 17 May 1982

(GPO-98-104) Avail: Committee on Energy and Natural Resources

A bill to enhance the ability of the administration to collect royalites due from Federal and Indian mineral leases is discussed. Author

**N83-23663#** Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

**STUDY OF MINERAL REGIONS IN THE SOUTHERN RIO GRANDE SHIELD WITH THE IMAGE 100 MULTI-SPECTRAL ANALYZER [ESTUDO DE REGIOES MINERALIZADAS DO ESCUDO SULRIOGRANDENSE, ATRAVES DE PROCESSAMENTOS REALIZADOS NO ANALISADOR MULTIESPECTRAL IMAGE-100]**

Tomoyuki Ohara Oct. 1982 20 p refs In PORTUGUESE; ENGLISH summary Original document contains color illustrations

(INPE-2559-PRE/210) Avail: NTIS HC A02/MF A01

The Multispectral Image Analyzer (Image-100 System) was used to enlarge (1:100.000) and to enhance the Lavras do Sul, Minas do Camaqua and Passo do Marinheiro regions, using Contrast Stretching and Principal Components programs. These regions are constituted for migmatitic, ectinitic, granitic, sedimentary and intermediary composition volcanic rocks. Structurally the faults are orientated to the northeast, northwest and north-northeast. The faults known as Cerro Alegre, Emiliano-Tapera, Passo do Marinheiro and the zone of faults called Acoteia-Piquiri are the most extensives and prominent faults in the studied area. The main contribution of the technique used in the study was the photogeologic individualization of two members of the Guaritas Formation (Guarda Velha Layers and Varzinha Layers). However, this technique did not provide sufficient enhancement to discriminate between mineralized and non-mineralized zones, probably due to the limited spatial resolution of the MSS LANDSAT data in relation to the extent of the studied mineral occurrences. In conclusion, the enhancement techniques showed very encouraging results to study regions of diffuse contrasts, by providing additional information to a visual photogeologic characterization. Author

**N83-23664#** National Transportation Safety Board, Washington, D. C. Bureau of Safety Programs.

**ANNUAL REVIEW OF AIRCRAFT ACCIDENT DATA, US AIR CARRIERS, CALENDAR YEAR 1980**

14 Jan. 1983 104 p

(NTSB-ARC-83-01) Avail: NTIS HC A06/MF A01

The record of aviation accidents involving revenue operations of U.S. Air Carriers for calendar year 1980 is presented. Accidents involving Commuter Air Carriers and On Demand Air Taxis are reported. Tables are presented to describe the losses and characteristics of 1980 accidents and to enable comparison with prior years. Author

**N83-23665#** Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

**OPERATION WINTER: THE USE OF SATELLITES TO MONITOR FROST IN BRAZIL**

Fausto C. JeAlmeida, Michael A. Fortune, and Iracema F. A. Cavalcanti Nov. 1982 21 p refs In PORTUGUESE; ENGLISH summary Presented at the 2nd Brazil. Meteorol. Conf., Pelotas, 1982

(INPE-2570-PRE/218) Avail: NTIS HC A02/MF A01

A frost-monitoring project that includes a special Operation Winter every cold season is discussed. Its purpose is to demonstrate the operational feasibility of detecting and immediately broadcasting the existence, location, and severity of freezing conditions, utilizing meteorological satellites. The equipment used and the procedures followed when a freeze alert is called are presented. Results from two frosts in 1982, including enhanced thermal imagery and temperature maps, are shown and discussed. Real time monitoring of the location and evolution of freezing conditions was shown to be feasible in the 1982 experiments. Author

**N83-23666#** Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

**DATA COLLECTION PLATFORMS: DATA PROCESSING AND DISSEMINATION**

Mauro de Mesquita Spinola Nov. 1982 12 p refs In PORTUGUESE; ENGLISH summary Presented at the 2nd Congr. Brasil de Meteorol., Pelotas, 1982

(INPE-2580-PRE/328) Avail: NTIS HC A02/MF A01

Reception, processing, and dissemination of data from the GOES Satellite data collection platform system is discussed. The characteristics of the processing involved in data treatment and dissemination. Emphasis is given to the techniques whereby users may obtain the above data. Author

**N83-23667#** Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

**INTERACTIVE IMAGE PROCESSING SYSTEM (SITIM)**

Jose Roberto deOliveira, Paolo Pio Gabriele Camilli, Juan Carlos Pinto deGarrido, Flavio R. Dias Velasco, and Ubirajara M. Barsoti deLima Nov. 1982 17 p refs In PORTUGUESE; ENGLISH summary Presented at the 2nd Congr. Brasil. de Meteorol., Pelotas, 1982

(INPE-2583-PRE/231) Avail: NTIS HC A02/MF A01

Each GOES satellite sends over 10 to the 11th bits of data daily in the form of images of the Earth. This volume of data would be enough to store a telephone directory that includes every person on Earth. The density of useful data, however, is low. The problem can be stated as how to convert a large data stream with a low density of information into a small data stream with a high density of relevant information. The SITIM is a digital imagem processing system which can do this type of conversion because it takes advantage of man-machine interaction. The SITIM consists of an Image Analysis Unit (IAU) with television displays, controlled by a minicomputer with a large volume (300 MB) of disk storage and which accepts data streams from a GOES Satellite direct receiving station. Author

**N83-23668#** Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

**DATA COLLECTION PLATFORMS**

Eduardo Meno Barreto Alonso Nov. 1982 11 p In PORTUGUESE; ENGLISH summary Presented at the 2nd Congr. Brasil. de Meteorol., Pelotas, Brazil, 1982

(INPE-2576-PRE/224) Avail: NTIS HC A02/MF A01

This work describes the various environmental data collection systems which make use of meteorological satellites network, currently in operation. The low orbit satellites (TIROS-N/NOAA series) and the geoestationary orbit satellites (SMS/GOES and METEOSAT series) are operating with Data Collection Platforms (DCP's). DCP is a telemetric station which collect environmental data and transmit via satellite to a ground receiving station. The data received by this station are then processed and distributed to all users in various formats such as telex, computer printouts, magnetic tape, etc. Author

**N83-23669*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

**SIMULATING SUNFLOWER CANOPY TEMPERATURES TO INFER ROOT-ZONE SOIL WATER POTENTIAL**

B. J. Choudhury and S. B. Idso Feb. 1983 20 p refs

(NASA-TM-84990; NAS 1.15:84990) Avail: NTIS HC A02/MF A01 CSCL 08H

A soil-plant-atmosphere model for sunflower (Helianthus annuus L.), together with clear sky weather data for several days, is used to study the relationship between canopy temperature and root-zone soil water potential. Considering the empirical dependence of stomatal resistance on insolation, air temperature and leaf water potential, a continuity equation for water flux in the soil-plant-atmosphere system is solved for the leaf water potential. The transpirational flux is calculated using Monteith's combination equation, while the canopy temperature is calculated from the energy balance equation. The simulation shows that, at high soil water potentials, canopy temperature is determined primarily by

air and dew point temperatures. These results agree with an empirically derived linear regression equation relating canopy-air temperature differential to air vapor pressure deficit. The model predictions of leaf water potential are also in agreement with observations, indicating that measurements of canopy temperature together with a knowledge of air and dew point temperatures can provide a reliable estimate of the root-zone soil water potential.
Author

**N83-23670*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
**MIZEX-WEST NASA CV-990 FLIGHT REPORT**
D. J. Cavalieri and P. Gloersen Apr. 1983 62 p
(NASA-TM-85020; NAS 1.15:85020) Avail: NTIS HC A04/MF A01 CSCL 08L

As part of the Bering Sea marginal ice zone winter experiment (MIZEX-WEST), the CV-990 airborne laboratory was flown to assess the potential of using an extended range of wavelengths for improving passive microwave sea ice observations from spacecraft and second to provide an overview of the MIZ for large-scale processes studies. The aircraft was equipped with both imaging and fixed-beam, dual-polarized passive microwave radiometers ranging from 1.5 millimeter to 3 centimeter wavelengths. Visual, photographic, and thermal (10.7 micron) infrared surface observations were also made from the aircraft to complement the microwave measurements. The flight operations and in-flight observations are discussed and each flight is summarized including flight objective and instrument status. Preliminary mosaic images obtained with the ESMR imager, Nimbus-7 orbits over the Bering Sea, ice observations obtained by an ice observer on board, and composite maps of the general ice conditions for the month of February are also presented. A.R.H.

**N83-23671*#** California Univ., Los Angeles. Dept. of Chemistry and Biochemistry.
**EFFECT OF PRESSURE ON INFRARED SPECTRA OF ICE 7**
W. B. Holzapfel, B. Seiler, and M. Nicol [1983] 17 p refs
(Grants NAGw-104; NSF CHE-81-11332)
(NASA-CR-170300; NAS 1.26:170300) Avail: NTIS HC A02/MF A01 CSCL 08L

The effect of pressure on the infrared spectra of H2O and D2O ice VII was studied at room temperature and pressures between 2 and 15 GPa with a Fourier transform infrared spectrometer and a diamond anvil high pressure cell. Two librational modes, one bending mode, and various overtone bands are well resolved. The stretching modes, nu sub 1 and nu sub 3 are poorly resolved due to overlap with diamond window absorption. Differences between the spectra of H2O and D2O are discussed.
Author

**N83-23672#** Cologne Univ. (West Germany). Inst. fuer Geophysik und Meteorologie.
**PLANKTON MEASUREMENTS FROM SATELLITES [PLANKTONMESSUNG VOM SATELLITEN]**
Gunthard Metzig 1982 85 p refs In GERMAN
(Contract DFG-Ra-195/35-4)
(Mitt-33; ISSN-0069-5882) Avail: NTIS HC A05/MF A01

The ocean water color was measured by multispectral satellite measurements to determine the chlorophyll concentration in the ocean water. The relationship between the computated radiation density, chlorophyll concentration and the optical depth of field of the atmosphere are described by multilinear regression theory. The values are compared with the algorithm values and with the in situ measurements. Transl. by E.A.K.

**N83-23673#** Technische Univ., Vienna (Austria). Inst. Fuer Photogrammetrie.
**INTERPRETATION OF COLOR INFRARED PICTURES. MAPPING OF VEGETATION DAMAGES IN BRIXLEGG-REEDS MAPPING OF THE MEUSIEDLER LAKE Ph.D. Thesis [INTERPRETATION VON FARBINFRAROTBILDERN KARTIERUNG VON VEGETATIONSSCHAEDEN IN BRIXLEGG SCHILFKARTIERUNG NEUSIEDLER SEE]**
Elmar Csaplovics Nov. 1982 190 p refs In GERMAN; ENGLISH summary
(Geowiss-Mitt-18) Avail: NTIS HC A09/MF A01

The efficiency of color infrared imagery interpretation for solving practical problems of vegetation mapping is discussed. The increasing of activities in using color infrared images for interpretation purposes of involved sciences are postulated. E.A.K.

**N83-23674#** Prakla-Seismos G.m.b.H., Hannover (West Germany).
**DETERMINATION OF HYDRAULIC FEATURES IN LOS ALAMOS, NEW MEXICO: THE SUE AND BACA EVENTS Final Report, Jun. 1981**
Gerhard Suhr Bonn Bundesministerium fuer Forschung und Technologie Dec. 1982 67 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-210; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformatonszentrum, Karlsruhe, West Ger. DM 14

Hydraulic fractures were investigated by seismic signals which were recorded on the surface and with 3 component borehole geophones in wells. The number of events was assessed and the magnitude frequency relationship established. It was found that the characteristics of the signals were different in two different lithological formations during the 8-hour pumping period of fracturing the granite. Approximately 1500 seismic events were created. At least seven of those were stronger than seismic magnitude -2 and were recorded on the surface. The mapping of hypocentres at consecutive times reveals the spatial development of the fracture. E.A.K.

**N83-23675#** Naval Surface Weapons Center, Dahlgren, Va. Strategic Systems Dept.
**COMPARISON OF POLE POSITIONS FROM MEDOC AND DMA OBSERVATIONS OF NAVY NAVIGATION SATELLITES Final Report**
M. Wendel Gouldman and Richard J. Anderle Sep. 1982 18 p refs
(AD-A122075; NSWC/TR-82-411) Avail: NTIS HC A02/MF A01 CSCL 08/5

The position of the Earth's spin axis with respect to the crust (polar motion) has been determined from Doppler observations of Navy Navigation Satellites by the Naval Surface Weapons Center and by the Defense Mapping Agency (DMA) since 1969. An international program to perform such computations was organized by the Centre Nationale d'Etudes Spatiale (CNES) in 1977 using somewhat different observing sites and computational procedures. Studies show that the observing locations used by the CNES are not adequate to determine pole position to an accuracy comparable to the DMA determinations. The use of the DMA station network results in a significantly improved determination of polar motion over the network used in CNES computations. An even greater improvement over CNES results is seen with the use of the DMA gravity field. Author (GRA)

**N83-23676#** Coastal Engineering Research Center, Fort Belvoir, Va.
**GEOLOGICAL CHARACTER AND MINERAL RESOURCES OF SOUTH CENTRAL LAKE ERIE**
S. Jeffress Williams and Edward P. Meisburger Oct. 1982 61 p refs
(AD-A123085; CERC-MR-82-9) Avail: NTIS HC A04/MF A01 CSCL 08/8

During the summers of 1977 and 1978, a 900-square kilometer region of southern Lake Erie, between the Ohio-Pennsylvania border and Erie, Pennsylvania, was surveyed, using high resolution seismic reflection equipment and long vibracores, to determine the shallow subbottom geologic character of the lake floor. Emphasis was placed on describing the sediments and identifying deposits of sand and gravel that might be dredged and used as fill for beach nourishment projects on Presque Isle Peninsula. A total of 416 kilometers of seismic profiles and 49 cores with an

average length of 4.1 meters were analyzed along with 23 grab samples. GRA

**N83-23677#** Los Alamos Scientific Lab., N. Mex.
**GEOTHERMAL INVESTIGATIONS IN OHIO AND PENNSYLVANIA**
Yarma Eckstein, Richard A. Heimlich, Donald F. Palmer, and Scott S. Shannon, Jr. Apr. 1982 93 p refs Prepared in cooperation with Kent State Univ.
(Contract W-7405-eng-36)
(DE82-016129; LA-9223-HDR) Avail: NTIS HC A05/MF A01

Values of heat flow were determined for the Appalachian Plateau in eastern Ohio and northwestern Pennsylvania. Corrected values for wells in Washington and Summit Counties, Ohio, are 1.36 and 1.37 heat flow units (HFU), respectively. Those of 1.84 and 2.00 HFU define a previously unknown heat flow high in Venango and Clarion counties, Pennsylvania. Thermal conductivity was measured for core samples from 12 wells in Ohio and 6 wells in Pennsylvania. Heat production was determined for 34 core and outcrop samples from Ohio, Pennsylvania, and New Jersey. DOE

**N83-23678#** Waterloo Univ. (Ontario). Dept. of Computer Science.
**LEAST-SQUARES ADJUSTMENT OF LARGE-SCALE GEODETIC NETWORKS BY ORTHOGONAL DECOMPOSITION**
J. A. George, G. H. Golub (Stanford Univ., Calif.), M. T. Heath (Union Carbide, Oak Ridge, Tenn.), and R. J. Plemmons (North Carolina State Univ., Raleigh) 1981 25 p refs Presented at the Symp. on Geodetic Networks and Computations, Munich, West Germany, 30 Aug. 1981
(Contract W-7405-eng-26)
(DE82-020905; CONF-8108138-1) Avail: NTIS HC A02/MF A01

Some recent developments in the solution of large sparse least squares problems typical of those arising in geodetic adjustment problems were reviewed. The new methods are distinguished by their use of orthogonal transformations which tend to improve numerical accuracy over the conventional approach based on the use of the normal equations. The adaptation of these new schemes to allow for the use of auxiliary storage and their extension to rank deficient problems are described. DOE

**N83-23679#** Bendix Field Engineering Corp., Grand Junction, Colo.
**URANIUM HYDROGEOCHEMICAL AND STREAM SEDIMENT RECONNAISSANCE OF THE PRINCE RUPERT NTMS QUADRANGLE, ALASKA**
D. L. Shettel, Jr., comp., S. L. Langfeldt, comp., L. C. Hardy, comp., R. F. DAndrea, Jr., comp., and R. J. Zinkl, comp. Nov. 1982 26 p refs Sponsored by DOE
(DE82-009663; GJBX-3-82) Avail: NTIS HC A03/MF A01

This report presents results of a Hydrogeochemical and Stream Sediment Reconnaissance (HSSR) of the Prince Rupert NTS quadrangle, Alaska. In addition to this abbreviated data release, more complete data are available to the public in machine readable form. These machine readable data, as well as quarterly or semiannual program progress reports containing further information on the HSSR program in general, or on the Los Alamos National Laboratory (LANL) portion of the program in particular, are available from DOE's Technical Library at its Grand Junction Area Office. Presented in this data release are location data, field analyses, and laboratory analyses of several different sample media. For the sake of brevity, many field site observations have not been included in this volume, these data are, however, available on the magnetic tape. Appendices A and B describe the sample media and summarize the analytical results for each medium. DOE

**N83-23680#** Los Alamos Scientific Lab., N. Mex.
**SEASAT-SATELLITE INVESTIGATION OF THE STRUCTURE OF WESTERN NEBRASKA AND ITS APPLICATION TO THE EVALUATION OF GEOTHERMAL RESOURCES**
J. Stix Mar. 1982 18 p refs
(Contract W-7405-eng-36)
(DE82-014128; LA-9275-HDR) Avail: NTIS HC A02/MF A01

SEASAT synthetic aperture radar (SAR) satellite imagery was used to interpret the structural framework and, indirectly, the geothermal potential of an area in western Nebraska. Lineaments were mapped from the imagery and then compared to known structure. SEASAT does record surface manifestations of subtle basement structures, particularly faults and joints. Furthermore, two areas with hot dry rock geothermal potential were delineated using SEASAT and other data. More subsurface geology and geophysical data are needed before a final evaluation of the geothermal potential is made. SEASAT imagery is a useful reconnaissance exploration tool in the interpretation of regional structure within areas of little topographic relief. DOE

**N83-23681#** Du Pont de Nemours (E. I.) and Co., Aiken, S.C.
**HYDROGEOCHEMICAL AND STREAM-SEDIMENT RECONNAISSANCE, ORIENTATION STUDY: OUACHITA MOUNTAIN AREA, ARKANSAS. NATIONAL URANIUM RESOURCE EVALUATION PROGRAM**
Kenneth F. Steele Aug. 1982 38 p refs
(Contract DE-AC09-76SR-00001)
(DE82-021068; GJBX-208-82; DPST-81-141-26) Avail: NTIS HC A03/MF A01

A hydrogeochemical ground water orientation study was conducted in the multi-mineralized area of the Ouachita Mountains, Arkansas in order to evaluate the usefulness of ground water as a sampling medium for uranium exploration in similar areas. Ninety-three springs and nine wells were sampled in Clark, Garland, Hot Springs, Howard, Montgomery, Pike, Polk, and Sevier Counties. Manganese, barite, celestite, cinnabar, stibnite, copper, lead, and zinc are present. The following parameters were determined: pH, conductivity, alkalinity, U, Br, Cl, F, He, Mn, Na, V, Al, Dy, NO3, NH3, SO4, and PO4. The minerals appear to significantly affect the chemistry of the ground water. DOE

**N83-23682#** High Life Helicopters, Inc., Puyallup, Wash.
**AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY: SOLITARIO, TEXAS, DETAIL AREA Final Report**
[1982] 170 p Prepared in cooperation with QEB, Inc., Lakewood, Colo.
(Contracts DE-AC13-76GJ-01664; DE-AC13-79GJ-01692)
(DE82-021622; GJBX-195-82-Vol-2B-Solitario) Avail: NTIS HC A08/MF A01

Appendices for flight line maps; geology maps; explanation of geologic legend; flight line/geology maps; radiometric contour maps; magnetic contour maps; multi-variant analysis maps; and geochemical factors analysis maps are given. DOE

**N83-23683#** Sandia Labs., Albuquerque, N. Mex.
**MEASUREMENT OF FORMATION-RESISTIVITY CHANGES INDUCED BY IN SITU COMBUSTION**
D. O. Lee and J. R. Wayland 1982 14 p refs Presented at the 57th AIME Soc. of Petroleum Engr. Ann. Tech. Conf. and Exhibition, New Orleans, 26 Sep. 1982
(Contract DE-AC04-76DP-00789)
(DE82-018975; SAND-82-0399C; CONF-820927-6) Avail: NTIS HC A02/MF A01

Use of controlled source audio magnetotelluric (CSAMT) techniques to map thermal fronts associated with enhanced oil recovery (EOR) processes depends upon knowledge of the changes in formation electrical resistivity. Measurement of these changes required the development of a technique which survives high temperatures and a very corrosive environment while measuring over a frequency range of 5 to 5000 Hz. The apparatus to make these measurements is described. The results from a laboratory forward dry combustion test in the University of Calgary combustion tube are presented. It is found that there is a two-decade change in the resistivity as the fire front traverses through a region. Also there are indications of the separate zones within a fire front. The importance of these results to interpreting CSAMT data are then considered. The frequency dependence of the resistivity changes suggests means of increasing CSAMT sensitivity for deep oil pay-zone mappings. DOE

**N83-23684#** CER Corp., Las Vegas, Nev.
**WESTERN GAS SANDS PROJECT Status Report, Oct. - Nov. 1981**
Alex Crawley (DOE, Bartlesville, Okla.) and C. H. Atkinson Jul. 1982 109 p refs
(Contract DE-AC08-79BC-10003)
(DE82-019224; DOE/BC-10003/26) Avail: NTIS HC A06/MF A01

This WGSP Quarterly Report summarizes the progress of government-sponsored projects aimed at recovering gas from low permeability gas sands in the Western United States during October, November and December 1981. CK GeoEnergy released the final report for Development of Techniques for Optimizing Selection and Completion of Western Gas Sands. For CER's Reservoir Simulation Model Development, primary emphasis during the quarter was placed on extending the previous work to include effects of massive hydraulic fractures intersecting multiple lenses. During the quarter, the University of Oklahoma completed the two-dimensional reservoir simulator for BETC. A simplified two-dimensional hydraulic fracturing model is being developed by LLL. A major activity this quarter at Los Alamos was redesigning the NMR receiver system, making it capable of being repackaged for downhole use. DOE

**N83-23685#** Pennsylvania State Univ., University Park. Coal Research Section.
**DATA BASE FOR THE ANALYSIS OF COMPOSITIONAL CHARACTERISTICS OF COAL SEAMS AND MACERALS Quarterly Technical Progress Report, May - Jul. 1981**
A. Davis, N. H. Suhr, W. Spackman, P. C. Painter, P. L. Walker, and P. H. Given Feb. 1982 76 p refs
(Contract DE-AC22-80PC-30013)
(DE82-012356; DOE/PC-30013/6) Avail: NTIS HC A05/MF A01

The first objective is to understand the systematic relationships between the properties of coals and the second is to determine the nature of lateral and vertical variability in the properties of a single seam. Five whole seam channel samples were collected from Illinois. Eighty-three coal samples and 120 printouts were provided on request to the coal research community. The equation $Q = 145\ C + 610\ H - 65\ O - 20$ where Q is the calorific value, and C, H and O are the carbon, hydrogen and oxygen contents, respectively, appears to provide the best means of estimating calorific value from ultimate analyses of coals in the Penn State Coal Data Base. Trends in the lateral variability of petrographic composition of Lower Kittanning seam samples are presented. Distinct trends in the composition and properties within a single coal seam enabled the areal changes in depositional environment and post-depositional metamorphic changes to be investigated. DOE

**N83-23686#** Edgerton, Germeshausen and Grier, Inc., Las Vegas, Nev. Energy Measurements Group.
**AERIAL RADIOLOGICAL SURVEY OF THE UNITED STATES DEPARTMENT OF ENERGY'S ROCKY FLATS PLANT, GOLDEN, COLORADO, DATE OF SURVEY, AUGUST 1981**
Sep. 1982 27 p refs
(Contract DE-AC08-76NV-01183)
(DE83-000931; EGG-1183-1771) Avail: NTIS HC A03/MF A01

An aerial radiological survey of the Rocky Flats Plant was conducted during August 1981. The survey consisted of an airborne measurement of both nautral and man-made gamma radiation from the terrain surface in and around the Rocky Flats Plant. These measurements allowed an estimate of the distribution of isotope concentrations in the survey area. Results are reported as exposure rate, man-made, and 241 Am isopleths superimposed on photographs of the area. The survey covered a square area approximately 9.7 km on each side. Gamma ray energy spectra are also presented for the net man-made radionuclides. DOE

**N83-23687#** Los Alamos Scientific Lab., N. Mex.
**GEOTHERMAL GRADIENT MAP OF THE CONTERMINOUS UNITED STATES**
A. Kron and J. Stix 1982 4 p refs Presented at Ann. Geothermal Resources Council Meeting, San Diego, Calif., 11 Oct. 1982
(Contract W-7405-eng-36)
(DE82-015727; LA-UR-82-1434) Avail: NTIS HC A02/MF A01

The second edition of the Geothermal Gradient Map of the Conterminous United States is described and the changes made since the first edition are compared. The second edition of the map presents a compilation of over 1700 wells that have been measured for temperature below 50 m and whose temperature/depth profiles are linear, or composed of linear segments which reflect changes in the thermal conductivity of the rocks rather than hydrology. The data are displayed at an enlarged scale of 1:2,500,000 and in a format which shows the location, depth, and gradient of each well in a single color coded symbol. This edition contains over two times the amount of data shown on the first map and is accompanied by a table, listing for each well its location, depth, gradient, heat flow (where available), thermal conductivity (where available), and a reference. Over 200 references were consulted and are presented with the data. DOE

**N83-23688#** Academy of Natural Sciences, Avondale, Pa.
**GEOGRAPHIC ANALYSIS OF THERMAL EQUILIBRIA: A BIOENERGETIC MODEL FOR PREDICTING THERMAL RESPONSE OF AQUATIC-INSECT COMMUNITIES Technical Progress Report, 1 Jan. 1981 - 31 Dec. 1982**
R. L. Vannote and B. W. Sweeney 27 Aug. 1982 163 p refs
(Contract DE-AC02-79EV-10259)
(DE82-020942; DOE/EV-10259/T2) Avail: NTIS HC A08/MF A01

A proposed conceptual model which describes the effects of natural and altered temperature regimes on larval growth and adult size and fecundity of hemimetabolous aquatic insects was tested. It is hypothesized that the stability of a given population within the geographic range of a species reflects mainly a dynamic equilibrium between temperature and individual growth, metabolism, reproductive potential, and generation time. The model predicts that geographic range extension away from a location with an optimum thermal regime are associated with temperature induced changes in the rate and efficiency of energy use, developmental processes, and generation time. DOE

**N83-23689#** Missouri Univ., Columbia. Dept. of Geology.
**THE HYDROGEOLOGY OF ALLUVIAL AQUIFERS IN OR BORDERING THE DISSECTED TILL PLAINS M.A. Thesis**
Lee Lewis Gorday May 1982 148 p refs Sponsored by Office of Water Resources and Technology
(PB83-139881; W83-01269; OWRT-A-129-MO(3)) Avail: NTIS HC ] A07/MF A01

The till plains area of northern Missouri currently has an inadequate supply of water, and the condition is expected to worsen as the demand for water grows. In this area, alluvial aquifers may be a low cost source for significant quantities of water. The alluvial aquifiers of Perche Creek were investigated. The thickness of the alluvium at Goodwater Creek averaged 4.1 m, and the hydraulic conductivity of the alluvium was 6.1 x 10 to the minus 7 m/s. Pump tests indicate an average hydraulic conductivity of .000-557 m/s for the Perche Creek alluvial aquifer. It is suggested that properly constructed wells in the Perche Creek alluvial aquifer could yield substantial quantities of water. GRA

**N83-23690#** Geological Survey, Tuscaloosa, Ala. Water Resources Div.
**WATER RESOURCE DATA FOR ALABAMA, WATER YEAR 1981 Annual Water-Data Report, 1 Oct. 1980 - 30 Sep. 1981**
Aug. 1982 552 p refs Sponsored in part by the Geological Survey of Alabama, the Alabama Highway Dept. and other State, Municipal and Federal Agencies
(PB83-132035; USGS-WRD-AL-81-1; USGS/WRD/HD-82/058) Avail: NTIS HC A24/MF A01 CSCL 08H

Water resources data for the 1981 water year for Alabama consist of records of stage, discharge, and water quality of streams; stage and contents of lakes and reservoirs, and water levels in wells. Discharge records are reported for 104 gaging stations; stage only for 16 gaging stations, stage and contents for 12 lakes

and reservoirs; water quality for 75 aging stations and 54 wells, and water levels for 53 observation wells. Also included are 19 crest stage partial record stations, 9 flood hydrograph partial record stations and 88 water quality partial record stations. GRA

**N83-23691#** National Academy of Sciences - National Research Council, Arlington, Va. Committe on Resource Evaluation.
**ASSESSING MINERAL AND ENERGY RESOURCE POTENTIAL. A REPORT ON A WORKSHOP ON DATA REQUIREMENTS, DATA SOURCES AND ASSESSMENT METHODOLOGIES FOR EVALUATING UNDISCOVERED RESOURCES Final Report**
Aug. 1981 41 p refs Sponsored in part by Bureau of Land Management
(PB83-107979) Avail: NTIS HC A03/MF A01 CSCL 08I

Presentations on various resources are given. Data requirements for assessing the resource potential of each are given and appropriate data sources and assessment methodologies and techniques are discussed. Assessment data requirements and sources are emphasized. Assessment techniques are also discussed. The evaluation of geologic hazard potential in relation to resource potential assessments are discussed. Author (GRA)

**N83-23692#** National Academy of Sciences - National Research Council, Arlington, Va.
**APPENDIX TO ASSESSING MINERAL AND ENERGY RESOURCE POTENTIAL: PROCEEDINGS OF A WORKSHOP ON DATA REQUIREMENTS, DATA SOURCES AND ASSESSMENT METHODOLOGIES FOR EVALUATING UNDISCOVERED RESOURCES Final Report**
Aug. 1982 407 p refs Workshop held at Denver, 26-28 Apr. 1982 Sponsored in part by Bureau of Land Management
(PB83-107987) Avail: NTIS HC A18/MF A01 CSCL 08I

An overview of the state-of-the-art of mineral and energy resource potential assessment is given. Data requirements, data sources, and assessment methodologies for evaluating undiscovered resource potential are discussed. Author (GRA)

**N83-23693#** Geological Survey, Urbana, Ill. Water Resources Div.
**WATER RESOURCE DATA ILLINOIS WATER YEAR 1981. VOLUME 1: ILLINOIS EXCEPT ILLINOIS RIVER BASIN Annual Water-Data Report, 1 Oct. 1980 - 30 Sep. 1981**
Sep. 1981 683 p refs Sponsored in part by state of Illinois
(PB83-119966; USGS/WRD/IL-81/2-Vol-1; USGS/WRD/HD-81/053-Vol-1) Avail: NTIS HC A99/MF A01 CSCL 08H

Water resources data for the 1981 water year for Illinois consist of records of stage, discharge, and water quality of streams; stage and contents of lakes and reservoirs; and water levels and water quality of ground-water wells. Records for water discharge at 94 gaging stations; stage at 17 gaging stations; stage and contents at 3 lakes and reservoirs; stage only at 1 lake station; and water quality at 121 gaging stations and 26 wells are given. Also included are data for 13 crest-stage partial-record stations and 22 low-flow partial-record stations. Author (GRA)

**N83-23694#** Geological Survey, Urbana, Ill. Water Resources Div.
**WATER RESOURCES DATA FOR ILLINOIS WATER YEAR 1981. VOLUME 2: ILLINOIS RIVER BASIN Annual Water-Data Report, 1 Oct. 1980 - 30 Sep. 1981**
Sep. 1981 547 p refs Sponsored in part by state of Illinois
(PB83-119974; USGS/WRD/IL-81/2-Vol-2; USGS/WRD/HD-81/054-Vol-2) Avail: NTIS HC A23/MF A01 CSCL 08H

Water resources data for the 1981 water year for Illinois consist of records of stage, discharge, and water quality of streams; stage and contents of lakes and reservoirs; and water levels and water quality of ground-water wells. Records for water discharge at 82 gaging stations; stage only at 2 gaging stations; stage only at 3 lake stations; water quality at 96 gaging stations and 10 wells; and water levels at 3 observation wells are given. Also included are data for 18 crest-stage partial-record stations. Author (GRA)

**N83-23695#** Zimbabwe Univ., Salisbury. Dept. of Agriculture.
**EFFECT OF CLOUD-SEEDING ON WATER STRESS OF MAIZE**
D. L. McNaughton (Dept. of Meteorological Services) and J. C. S. Allison 1982 21 p refs Repr. from J. Agric. Res. (Zimbabwe), no. 20, 1982 p 39-57
(PB83-113670) Avail: NTIS HC A02/MF A01 CSCL 02D

Results of experimental cloud seeding in Zimbabwe are summarized, and indicate that silver iodide treatment enhances rainfall if cloud tops are colder than 10 C. Higher increases result if tops are colder than 13 C. By comparing distribution functions fitted to seeded and to nonseeded clouds, tentative relationships were built up between natural and seeded rainfalls. A model was developed capable of simulating a cloud seeding season in northeast Zimbabwe, whereby 1,000 showers were distributed at random within a rectangular area, enabling total extra rainfall to be computed at every km grid point. Less than half the area received any additional rainfall. A soil water balance routine was then used to relate the apparently increased rainfall to changes in maize yield. In approximately half of all rainy seasons in northern Zimbabwe there appears to be adequate natural rainfall such that cloud seeding is of negligible benefit to maize. DOE

# 44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

**N83-23696*** National Aeronautics and Space Administration, Washington, D. C.
**ENERGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES**
Oct. 1982 223 p
(NASA-SP-7043(35); NAS 1.21:7043(35)) Avail: NTIS HC A10 CSCL 10B

This bibliography lists 881 reports, articles, and other documents introduced into the NASA scientific and technical information system from July 1, 1982 through September 30, 1982. Author

**N83-23697*#** Critical Fluid Systems, Inc., Cambridge, Mass.
**ASSESSMENT OF CRITICAL-FLUID EXTRACTIONS IN THE PROCESS INDUSTRIES Final Report**
Apr. 1982 40 p refs Prepared for JPL, Pasadena, Calif.
(Contracts JPL-956159; DE-AI01-81CS-66001)
(NASA-CR-170243; JPL-9950-793; NAS 1.26:170243) Avail: NTIS HC A03/MF A01 CSCL 10A

The potential for critical-fluid extraction as a separation process for improving the productive use of energy in the process industries is assessed. Critical-fluid extraction involves the use of fluids, normally gaseous at ambient conditions, as extraction solvents at temperatures and pressures around the critical point. Equilibrium and kinetic properties in this regime are very favorable for solvent applications, and generally allow major reductions in the energy requirements for separating and purifying chemical component of a mixture. Author

**N83-23698*#** Westinghouse Research and Development Center, Pittsburgh, Pa.
**EVALUATION OF SOLID OXIDE FUEL CELL SYSTEMS FOR ELECTRICITY GENERATION Final Report**
E. V. Somers, E. J. Vidt, and R. E. Grimble Dec. 1982 35 p refs
(Contracts NAS7-100; JPL-956252; DE-AC20-80ET-17089)
Avail: NTIS HC A03/MF A01 CSCL 10A

Air blown (low BTU) gasification with atmospheric pressure Solid Electrolyte Fuel Cells (SOFC) and Rankine bottoming cycle,

oxygen blown (medium BTU) gasification with atmospheric pressure SOFC and Rankine bottoming cycle, air blown gasification with pressurized SOFC and combined Brayton/Rankine bottoming cycle, oxygen blown gasification with pressurized SOFC and combined Brayton/Rankine bottoming cycle were evaluated. Author

**N83-23699*#** Solarelectronics, Inc., Bellingham, Mass.
**INVESTIGATION OF THE HYDROCHLORINATION OF SiCl4 Quarterly Report, 9 Oct. 1982 - 8 Jan. 1983**
Jeffrey Y. P. Mui 18 Jan. 1983 45 p refs
(Contract JPL-956061)
(NASA-CR-170235; JPL-9950-804; DOE/JPL-956061-6; NAS 1.26:170235; QR-6) Avail: NTIS HC A03/MF A01 CSCL 10A

A basic, experimental study on the hydrochlorination of silicon tetrachloride and metallurgical grade silicon with hydrogen gas to form trichlorosilane was carried out to greatly expand the range of reaction conditions. The equilibrium constant, K sub p, for the hydrochlorination reaction was measured as a function of temperature, pressure and concentration. The variation of the equilibrium constant as a function of temperature provided the measurement on the heat of reaction, delta H, by the Second Law Method. The value of delta H was measured to give 10.6 Kcal/mole. The equilibrium constant was also studied as a function of concentration. In agreement with the theory, the equilibrium constant remained constant with respect to the varying H2/SiCl4 feed ratios. On the other hand, the effect of pressure on the equilibrium constant was found to be more complex. S.L.

**N83-23700*#** Materials Research, Inc., Centerville, Utah.
**ANALYSIS OF DEFECT STRUCTURE IN SILICON. CHARACTERIZATION OF SEMIX MATERIAL. SILICON SHEET GROWTH DEVELOPMENT FOR THE LARGE AREA SILICON SHEET TASK OF THE LOW-COST SOLAR ARRAY PROJECT Final Report**
R. Natesh, G. B. Stringfellow, A. V. Virkar, J. Dunn, and T. Guyer Feb. 1983 138 p refs Sponsored in part by DOE Prepared for JPL
(Contract JPL-955676)
(NASA-CR-170239; JPL-9950-808; DOE/JPL-955676-4; NAS 1.26:170239) Avail: NTIS HC A07/MF A01 CSCL 10A

Statistically significant quantitative structural imperfection measurements were made on samples from ubiquitous crystalline process (UCP) Ingot 5848 - 13C. Important correlation was obtained between defect densities, cell efficiency, and diffusion length. Grain boundary substructure displayed a strong influence on the conversion efficiency of solar cells from Semix material. Quantitative microscopy measurements gave statistically significant information compared to other microanalytical techniques. A surface preparation technique to obtain proper contrast of structural defects suitable for quantimet quantitative image analyzer (QTM) analysis was perfected and is used routinely. The relationships between hole mobility and grain boundary density was determined. Mobility was measured using the van der Pauw technique, and grain boundary density was measured using quantitative microscopy technique. Mobility was found to decrease with increasing grain boundary density. Author

**N83-23701*#** Illinois Tool Works, Inc., Elgin. Venture Group.
**ION-PLATING OF SOLAR CELL ARRAYS ENCAPSULATION TASK: LSA PROJECT 32 Final Report**
Jack C. Volkers [1983] 37 p refs Sponsored in part by DOE Prepared for JPL
(Contract JPL-955506)
(NASA-CR-170244; JPL-9950815; DOE/JPL-955506-83/3; NAS 1.26:170244) Avail: NTIS HC A03/MF A01 CSCL 10A

An ion plating process by which solar cells can be metallized and AR coated, yielding efficiencies equal to or better than state-of-the-art cells, was developed. It was demonstrated that ion plated AR films may be used as an effective encapsulant, offering primary protection for the metallization. It was also shown that ion plated metallization and AR coatings can be consistent with the project cost goals. Author

**N83-23702*#** Westinghouse Electric Corp., Pittsburgh, Pa. Advanced Energy Systems Div.
**LOW COST SOLAR ARRAY PROJECT. CELL AND MODULE FORMATION RESEARCH AREA. PROCESS RESEARCH OF NON-CZ SILICON MATERIAL Quarterly Report, 1 Dec. 1982 - 28 Feb. 1983**
1983 34 p refs Sponsored in part by DOE Prepared for JPL
(Contract JPL-955909)
(NASA-CR-170241; JPL-9950-816; DOE/JPL-955909-83/9; NAS 1.26:170241; QR-4) Avail: NTIS HC A03/MF A01 CSCL 10A

Liquid diffusion masks and liquid dopants to replace the more expensive CVD SiO2 mask and gaseous diffusion processes were investigated. Silicon pellets were prepared in the silicon shot tower; and solar cells were fabricated using web grown where the pellets were used as a replenishment material. Verification runs were made using the boron dopant and liquid diffusion mask materials. The average of cells produced in these runs was 13%. The relationship of sheet resistivity, temperature, gas flows, and gas composition for the diffusion of the P-8 liquid phosphorus solution was investigated. Solar cells processed from web grown from Si shot material were evaluated, and results qualified the use of the material produced in the shot tower for web furnace feed stock. A.R.H.

**N83-23703*#** Spectrolab, Inc., Sylmar, Calif.
**DESIGN, ANALYSIS AND TEST VERIFICATION OF ADVANCED ENCAPSULATION SYSTEMS Triannual Report, period ending 30 Nov. 1982**
Alexander Garcia, III Feb. 1983 20 p refs Sponsored in part by DOE Prepared for JPL
(Contract JPL-955567)
(NASA-CR-170240; JPL-9950-817; DOE/JPL-955567-83/10; NAS 1.26:170240) Avail: NTIS HC A02/MF A01 CSCL 10A

A preliminary reduced variable master was constructed for pressure loading. A study of cell thickness versus cell stress was completed. Work is continuing on encapsulation of qualification modules. A 4 ft x 4 ft 'credit card' construction laminate was made. Author

**N83-23704*#** Technical Report Services, Rocky River, Ohio.
**DESIGN AND EVALUATION OF LOW-COST LAMINATED WOOD COMPOSITE BLADES FOR INTERMEDIATE SIZE WIND TURBINES: BLADE DESIGN, FABRICATION CONCEPT, AND COST ANALYSIS Interim Report**
Seymour Lieblein, Meade Gaugeon, Georg Thomas, and Michael Zueck Nov. 1982 120 p refs Prepared in cooperation with Gaugeon Bros., Inc., Bay City, Mich.
(Contracts DEN3-101; DE-AI01-76ET-20320)
(NASA-CR-165463; DOE/NASA/0101-1; NAS 1.26:165463; TRS-107) Avail: NTIS HC A06/MF A01 CSCL 10B

As part of a program to reduce wind turbine costs, an evaluation was conducted of a laminated wood composite blade for the Mod-OA 200 kW wind turbine. The effort included the design and fabrication concept for the blade, together with cost and load analyses. The blade structure is composed of laminated Douglas fir veneers for the primary spar and nose sections, and honeycomb cored plywood panels for the trailing edges sections. The attachment of the wood blade to the rotor hub was through load takeoff studs bonded into the blade root. Tests were conducted on specimens of the key structural components to verify the feasibility of the concept. It is concluded that the proposed wood composite blade design and fabrication concept is suitable for Mod-OA size turbines (125-ft diameter rotor) at a cost that is very competitive with other methods of manufacture. S.L.

**N83-23705*#** Jet Propulsion Lab., California Inst. of Tech., Pasadena.
**PROCEEDINGS: FOURTH PARABOLIC DISH SOLAR THERMAL POWER PROGRAM REVIEW**
1 Feb. 1983 340 p refs
(Contract DE-AM04-80AL-13137)
(NASA-CR-170297; DOE/JPL-1060/58; JPL-Pub-83-2; JPL-5105-122; NAS 1.26:170297) Avail: NTIS HC A15/MF A01

CSCL 10A

The results of activities within the parabolic dish technology and applications development program are presented. Stirling, organic Rankine and Brayton module technologies, associated hardware and test results to date; concentrator development and progress; economic analyses; and international dish development activities are covered. Two panel discussions, concerning industry issues affecting solar thermal dish development and dish technology from a utility/user perspective, are also included. S.L.

**N83-23706*#** Jet Propulsion Lab., California Inst. of Tech., Pasadena.

**A STANDARD DESCRIPTION AND COSTING METHODOLOGY FOR THE BALANCE-OF-PLANT ITEMS OF A SOLAR THERMAL ELECTRIC POWER PLANT. REPORT OF A MULTI-INSTITUTIONAL WORKING GROUP**

Jan. 1983 58 p refs Sponsored by NASA
(NASA-CR-170293; NAS 1.26:170293; DOE/JPL-160-59; Rept-5106-21; JPL-Publ-83-4) Avail: NTIS HC A04/MF A01 CSCL 10B

Standard descriptions for solar thermal power plants are established and uniform costing methodologies for nondevelopmental balance of plant (BOP) items are developed. The descriptions and methodologies developed are applicable to the major systems. These systems include the central receiver, parabolic dish, parabolic trough, hemispherical bowl, and solar pond. The standard plant is defined in terms of four categories comprising (1) solar energy collection, (2) power conversion, (3) energy storage, and (4) balance of plant. Each of these categories is described in terms of the type and function of components and/or subsystems within the category. A detailed description is given for the BOP category. BOP contains a number of nondevelopmental items that are common to all solar thermal systems. A standard methodology for determining the costs of these nondevelopmental BOP items is given. The methodology is presented in the form of cost equations involving cost factors such as unit costs. A set of baseline values for the normalized cost factors is also given. S.L.

**N83-23707*#** Jet Propulsion Lab., California Inst. of Tech., Pasadena.

**PHOTOVOLTAIC RESEARCH AND DEVELOPMENT IN JAPAN**

Katsunori Shimada 15 Feb. 1983 36 p Sponsored by NASA
(NASA-CR-170292; NAS 1.26:170292; DOE/JPL-1012-80; Rept-5230-9; JPL-Pub-83-8) Avail: NTIS HC A03/MF A01 CSCL 10A

The status of the Japanese photovoltaic (PV) R&D activities was surveyed through literature searches, private communications, and site visits in 1982. The results show that the Japanese photovoltaic technology is maturing rapidly, consistent with the steady government funding under the Sunshine Project. Two main thrusts of the Project are: (1) completion of the solar panel production pilot plants using cast ingot and sheet silicon materials, and (2) development of large area amorphous silicon solar cells with acceptable efficiency (10 to 12%). An experimental automated solar panel production plant rated at 500 kW/yr is currently under construction for the Sunshine Project for completion in March 1983. Efficiencies demonstrated by experimental large are amorphous silicon solar cells are approaching 8%. Small area amorphous silicon solar cells are, however, currently being mass produced and marketed by several companies at an equivalent annual rate of 2 MW/yr for consumer electronic applications. There is no evidence of an immediate move by the Japanese PV industry to enter extensively into the photovoltaic power market, domestic or otherwise. However, the photovoltaic technology itself could become ready for such an entry in the very near future, especially by making use of advanced process automation technologies.

Author

**N83-23708*#** Giner, Inc., Waltham, Mass.

**OPTIMIZATION AND FABRICATION OF POROUS CARBON ELECTRODES FOR Fe/Cr REDOX FLOW CELLS Final Report**

Vinod Jalan, Brian Morriseau, and Larry Swette Jul. 1982 157 p refs
(Contracts DEN3-198; DE-AI04-80AL-12726)
(NASA-CR-167921; NAS 1.26:167921; DOE/NASA/0198-1) Avail: NTIS HC A08/MF A01 CSCL 10C

Negative electrode development for the NASA chromous/ferric Redox battery is reported. The effects of substrate material, gold/lead catalyst composition and loading, and catalyzation procedures on the performance of the chromium electrode were investigated. Three alternative catalyst systems were also examined, and 1/3 square foot size electrodes were fabricated and delivered to NASA at the conclusion of the program. Author

**N83-23709*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

**ANALYSIS OF THE ECONOMICS OF PHOTOVOLTAIC-DIESEL-BATTERY ENERGY SYSTEMS FOR REMOTE APPLICATIONS**

William A. Brainard 1983 9 p refs Presented at the Ann. Meeting of the American Solar Energy Soc., Minneapolis, 1-3 Jun. 1983
(Contract DE-AI01-79ET-20485)
(NASA-TM-83377; DOE/NASA/20485-14; E-1645; NAS 1.15:83377) Avail: NTIS HC A02/MF A01 CSCL 10C

Computer simulations were conducted to analyze the performance and operating cost of a photovoltaic energy source combined with a diesel generator system and battery storage. The simulations were based on the load demand profiles used for the design of an all photovoltaic energy system installed in the remote Papago Indian Village of Schuchuli, Arizona. Twenty year simulations were run using solar insolation data from Phoenix SOLMET tapes. Total energy produced, energy consumed, operation and maintenance costs were calculated. The life cycle and levelized energy costs were determined for a variety of system configurations (i.e., varying amounts of photovoltaic array and battery storage). Author

**N83-23710*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

**STRUCTURAL QUALIFICATION TESTING AND OPERATIONAL LOADING ON A FIBERGLASS ROTOR BLADE FOR THE MOD-OA WIND TURBINE Final Report**

Timothy L. Sullivan Mar. 1983 26 p refs
(Contract DE-AI01-76ET-20320)
(NASA-TM-83309; NASA/DOE/20320-44; E-1548; NAS 1.15:83309) Avail: NTIS HC A03/MF A01 CSCL 10A

Fatigue tests were performed on full- and half-scale root end sections, first to qualify the root retention design, and second to induce failure. Test methodology and results are presented. Two operational blades were proof tested to design limit load to ascertain buckling resistance. Measurements of natural frequency, damping ratio, and deflection under load made on the operational blades are documented. The tests showed that all structural design requirements were met or exceeded. Blade loads measured during 3000 hr of field operation were close to those expected. The measured loads validated the loads used in the fatigue tests and gave high confidence in the ability of the blades to achieve design life. Author

**N83-23711#** Argonne National Lab., Ill. Occupational Health and Safety Div.

**ENVIRONMENTAL MONITORING AT ARGONNE NATIONAL LABORATORY Annual Report, 1981**

N. W. Golchert, T. L. Duffy, and J. Sedlet Mar. 1982 87 p refs
(Contract W-31-109-eng-38)
(ANL-81-12) Avail: NTIS HC A05/MF A01

The effect of laboratory operations on the environment was evaluated. Measurements were made for a variety of radionuclides in air, surface water, soil, grass, bottom sediment, and milk; for a variety of chemical constituents in air, surface water, and effluent water; and of the environmental penetrating radiation dose. Sample collections and measurements were made at the site boundary and off the laboratory site for comparison purposes. Some on-site measurements were made to aid in the interpretation of the boundary and off-site data. The results of the program are interpreted in terms of the sources and origin of the radioactive

and chemical substances (natural, fallout, laboratory, and other) and are compared with applicable environmental quality standards. The potential radiation dose to off-site population groups is also estimated. S.L.

**N83-23712*#** Illinois Univ., Chicago. Dept. of Civil Engineering, Mechanics and Metallurgy.
**STUDY OF ABRASIVE WEAR RATE OF SILICON USING n-ALCOHOLS Quarterly Progress Report**
Steven Danyluk [1982] 50 p refs Sponsored in part by DOE Prepared for JPL
(Contract JPL-956053)
(NASA-CR-170242; NAS 1.26:170242; UILU-82-1; QPR-4) Avail: NTIS HC A03/MF A01 CSCL 10A

The work carried out at the University of Illinois at Chicago for the Flat-Plate Solar Array Project under contract No. 956053 is summarized. The abrasion wear rate of silicon in a number of fluid environments and the parameters that influence the surface mechanical properties of silicon were determined. Three tests were carried out in this study: circular and linear multiple-scratch test, microhardness test and a three-point bend test. The pertinent parameters such as effect of surface orientation, dopant and fluid properties were sorted. A brief review and critique of previous work is presented. Author

**N83-23713*#** Toronto Univ. (Ontario). Dept. of Chemistry.
**MODELING OF POLYMER PHOTODEGRADATION FOR SOLAR CELL MODULES Quarterly Technical Progress Report, 1 May - 30 Jun. 1982**
J. E. Guillet Jul. 1982 9 p refs Sponsored by NASA and DOE Prepared for JPL
(NASA-CR-170230; JPL-9950-811; DOE/JPL-955591-82/4; NAS 1.26:170230) Avail: NTIS HC A02/MF A01 CSCL 10A

The photodegradation of synthetic polymers, used as pottants and/or cover sheets in the FSA solar cell module designs, is modeled. Author

**N83-23714*#** Toronto Univ. (Ontario). Dept. of Chemistry.
**MODELLING OF POLYMER PHOTODEGRADATION FOR SOLAR CELL MODULES Quarterly Technical Progress Report, 1 Jul. - 30 Sep. 1982**
J. E. Guillet 30 Sep. 1982 11 p refs Sponsored by NASA and DOE Prepared for JPL
(NASA-CR-170231; JPL-9950-812; DOE/JPL-955591-82/5; NAS 1.26:170231) Avail: NTIS HC A02/MF A01 CSCL 10A

A computer program which simulates the complex processes of photooxidation which take place in a polymer upon prolonged exposure outdoors causing it to fail in photovoltaic and other applications. The method calculates from an input data set of elementary reactions and rates the concentration profiles of all species over time. Author

**N83-23715#** Committee on Energy and Natural Resources (U.S. Senate).
**FINAL 5-YEAR PLAN FOR OIL AND GAS DEVELOPMENT IN THE OUTER CONTINENTAL SHELF**
Washington GPO 1982 193 p refs Hearing before the Subcomm. on Energy Conserv. and Supply of the Comm. on Energy and Natural Resources, 97th Congr., 2d Sess., 8 Sep. 1982
(GPO-11-566) Avail: Subcommittee on Energy Conservation and Supply

The five year plan for oil and gas development in the outer continental shelf was discussed, considering such aspects as protecting marine, coastal, and human environments, as well as, our energy needs. B.G.

**N83-23716#** Committee on Energy and Natural Resources (U.S. Senate).
**FEDERAL POWER ACT AMENDMENTS OF 1982**
Washington GPO 1982 120 p Hearing on S. 2500 before the Subcomm. on Energy Regulation of the Comm. on Energy and Natural Resources, 97th Congr., 2d Sess., 22 Jul. 1982
(GPO-09-140) Avail: Subcommittee on Energy Regulation

Testimony on a bill to amend the hydroelectric licensing provisions of the Federal Power Act is presented. Author

**N83-23717#** Committee on Energy and Natural Resources (U.S. Senate).
**ENERGY INITIATIVES OF THE 96TH CONGRESS**
Jun. 1982 255 p refs Rept. presented by the Comm. on Energy and Nat. Resources, 97th Congr., 2nd Sess., Jun. 1982 Prepared by the Congressional Research Service, Library of Congress
(Publ-97-73; GPO-94-897) Avail: Committee on Energy and Natural Resources

The Energy Security Act of 1980 is discussed. Fossil fuels energy policy, nuclear power issues, solar and renewable energy research and development, energy conservation programs, and organizational policy are also discussed. Author

**N83-23718#** Committee on Energy and Natural Resources (U.S. Senate).
**US PARTICIPATION IN THE INTERNATIONAL ENERGY PROGRAM**
Washington GPO 1982 87 p refs Hearing on S. 1937 before the Comm. on Energy and Natural Resources, 97th Congr., 2d Sess., 4 Feb. 1982
(GPO-95-065) Avail: Committee on Energy and Natural Resources

Issues relating to the international energy program, including issues concerning U.S. participation are considered. Extending participation of U.S. oil companies in the international energy program is also considered. Author

**N83-23719#** Committee on Energy and Natural Resources (U.S. Senate).
**DEPARTMENT OF ENERGY RESEARCH AND DEVELOPMENT PROGRAMS**
Washington GPO 1983 893 p refs Hearings before the Subcomm. on Energy Res. and Develop. of the Comm. on Energy and Natural Resources, 97th Congr., 2d Sess., 15, 17, 19 Mar. and 26 Apr. 1982
(GPO-12-484) Avail: Subcommittee on Energy Research and Development

Conservation and renewable energy program budget requests are reviewed. Author

**N83-23720#** Sandia Labs., Albuquerque, N. Mex.
**MIDTEMPERATURE SOLAR-SYSTEMS TEST FACILITY PREDICTIONS FOR THERMAL PERFORMANCE BASED ON TEST DATE OF LOW- TO MEDIUM-TEMPERATURE LINE-FOCUSING SOLAR COLLECTORS: E-SYSTEMS, FRESNEL-LENS COLLECTOR**
T. D. Harrison Feb. 1982 20 p refs
(Contract DE-AC04-76DP-00789)
(DE82-012606; SAND-82-0092/2) Avail: NTIS HC A02/MF A01

Thermal performance predictions based on test data are presented for the E-Systems Fresnel Lens solar collector for five output temperatures at eight cities in the United States. DOE

**N83-23721#** Department of Energy, Washington, D. C. Office of Assistant Secretary for Conservation and Renewable Energy.
**APPLICATIONS STUDY FOR WIND ENERGY SYSTEMS AT FEDERAL FACILITIES Final Report**
Sep. 1981 101 p refs
(DE82-007929; DOE/NBM-1004-Vol-2) Avail: NTIS HC A06/MF A01

An assessment of the possible applications for wind systems in the Federal sector is presented. The technical and nontechnical issues which need to be addressed in planning for economic competitiveness with the marginal costs of conventional energy sources in the respective areas are identified. S.L.

**N83-23722#** Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
**PROCEEDINGS: SMALL WIND TURBINE SYSTEMS, 1981**
1981 438 p refs Conf. held in Boulder, Colo., 12-14 May 1981; sponsored by Rockwell International Corp. and Dept. of Agriculture

(Contract DE-AC04-76DP-3533)
(SERI/CP-635-1212) Avail: NTIS HC A19/MF A01

Small wind turbine technology is discussed. Systems development, test programs, utility interface issues, safety and reliability programs, applications, and marketing are discussed. For individual titles, see N83-23723 through N83-23741.

**N83-23723#** Aerospace Systems, Inc., Burlington, Mass.
**HIGH-RELIABILITY VERTICAL-AXIS WIND TURBINE**
Richard B. Noll and John Zvara *In* Midwest Research Inst. Proc.: Small Wind Turbine Systems, I981 1981 p 17-28 refs (For primary document see N83-23722 13-44)
Avail: NTIS HC A19/MF A01

A review of the design and development of a 1-kW high-reliability vertical-axis small wind energy conversion system (SWECS) is presented. The SWECS is a straight-bladed version of the Darrieus design. It incorporates high-reliability components in order to obtain a design value of mean time between failures of ten years based on one maintenance day a year. Design features are described, automatic control of the turbine is discussed, and typical results from controlled velocity testing are presented. R.J.F.

**N83-23724#** United Technologies Research Center, East Hartford, Conn.
**UTRC 15 kW WIND TURBINE DEVELOPMENT**
M. C. Cheney *In* Midwest Research Inst. Proc.: Small Wind Turbine Systems, 1981 1981 p 31-46 refs (For primary document see N83-23722 13-44)
Avail: NTIS HC A19/MF A01

The prototype design and performance of a 15 kW wind turbine is described. A bearingless rotor concept was followed. The 15 kW design is a growth version of a smaller system and incorporates many improvements identified during the 8 kW program. Two significant changes made were to replace the guyed tower design with a free standing tower and to incorporate the main frame and rotor shaft supports into the transmission. Fabrication was completed early in 1981 and initial testing began in March 1981. Successful operation of the prototype was achieved during field tests. R.J.F.

**N83-23725#** Rockwell International Corp., Golden, Colo. Energy Systems Group.
**STATUS OF SWECS TESTING PROGRAMS AT THE ROCKY FLATS SMALL WIND SYSTEMS TEST CENTER**
I. B. Allen *In* Midwest Research Inst. Proc.: Small Wind Turbine Systems, 1981 1981 p 51-63 (For primary document see N83-23722 13-44)
Avail: NTIS HC A19/MF A01

Testing programs for wind turbines at the new Rocky Flats Wind Systems test center are discussed. Prototype testing and data acquisition capabilities are discussed. R.J.F.

**N83-23726#** United Technologies Research Center, East Hartford, Conn.
**UTRC 8 kW WIND TURBINE DEVELOPMENT**
T. A. Murrin *In* Midwest Research Inst. Proc.: Small Wind Turbine Systems, 1981 1981 p 67-76 refs (For primary document see N83-23722 13-44)
Avail: NTIS HC A19/MF A01

A prototype 8 kW Wind Turbine Generator was redesigned for reduced cost and increased reliability and designated the UTRC Model 108. A test program was conducted using a Model 108 equipped with power and load-measuring instrumentation, and measurements were made of system performance, blade pitch angle, and rotor moments. The Model 108 design is discussed and changes from the prototype 8 kW system are highlighted. The results of the test program are given along with an analyses conducted during the development effort. R.J.F.

**N83-23727#** Kaman Aerospace Corp., Bloomfield, Conn.
**DEVELOPMENT AND TESTING OF THE KAMAN 40 kW TURBINE GENERATOR**
Bruce A. Goodale *In* Midwest Research Inst. Proc.: Small Wind Turbine Systems, 1981 1981 p 81-92 (For primary document see N83-23722 13-44)
Avail: NTIS HC A19/MF A01

A horizontal axis wind turbine generator rated at 40 kW at 9 m/s is discussed. The system has a 19.5 m diameter rotor with two fiberglass blades mounted downwind of the tower at a hub height of 23 m. To accommodate various output configurations, a variable pitch rotor with a microprocessor controller is incorporated. During fabrication, lessons were learned which will improve producibility at lower costs, and these are discussed. Also discussed are some of the development problems encountered and corrected during the Contractor's test program and during the testing now in process at the Rocky Flats facility. Performance appears to show good correlation with predicted levels, and the prototype is considered to represent a successful system on which to base future production. R.J.F.

**N83-23728#** McDonnell Aircraft Co., St. Louis, Mo.
**THE 40 kW GIROMILL**
John Anderson *In* Midwest Research Inst. Proc.: Small Wind Turbine Systems, 1981 1981 p 93-105 (For primary document see N83-23722 13-44)
Avail: NTIS HC A19/MF A01

A prototype Giromill wind turbine is discussed. The Giromill is a vertical axis wind turbine with articulating vertical blades programmed through a microprocessor to catch the wind from any direction and maintain constant rotor RPM. The articulating blades provide not only a very high energy conversion efficiency but also a self-starting capability and additional safety by allowing the blades to weathervane in high winds. The blades are straight and simple structures with no twist and, much like the remaining structure, is less complex than many other windmills. Power transmission, control system, and electrical generator are located at the ground level for convenient access and maintenance. Direct mechanical power is also available at ground level for irrigation pumping. R.J.F.

**N83-23729#** Central Solar Energy Research Corp., Detroit, Mich.
**ANALYZING THE REQUIREMENTS FOR MASS PRODUCTION OF SMALL WIND TURBINE GENERATORS**
Todd Anuskiewicz, Jes Asmussen, and Oscar Frankenfield *In* Midwest Research Inst. Proc.: Small Wind Turbine Systems, 1981 1981 p 107-121 (For primary document see N83-23722 13-44)
Avail: NTIS HC A19/MF A01

Mass producibility of small wind turbine generators to give manufacturers design and cost data for profitable production operations is discussed. A 15 kW wind turbine generator for production in annual volumes from 1,000 to 50,000 units is discussed. Methodology to cost the systems effectively is explained. The process estimate sequence followed is outlined with emphasis on the process estimate sheets compiled for each component and subsystem. These data enabled analysts to develop cost breakdown profiles crucial in manufacturing decision-making. The appraisal also led to various design recommendations including replacement of aluminum towers with cost effective carbon steel towers. Extensive cost information is supplied in tables covering subassemblies, capital requirements, and levelized energy costs. The physical layout of the plant is depicted to guide manufacturers in taking advantage of the growing business opportunity now offered in conjunction with the national need for energy development. R.J.F.

**N83-23730#** Rockwell International Corp., Golden, Colo. Energy Systems Group.
**SWECS TOWER DYNAMICS ANALYSIS METHODS AND RESULTS**
Alan D. Wright *In* Midwest Research Inst. Proc.: Small Wind Turbine Systems, 1981 1981 p 127-147 refs (For primary document see N83-23722 13-44)
Avail: NTIS HC A19/MF A01

At the Rocky Flats Wind Systems Center, several different tower dynamics analysis methods and computer codes are used

to determine the natural frequencies and mode shapes of both guyed and freestanding wind turbine towers. These analysis methods are described and the results for two types of towers: a guyed tower and a freestanding tower are shown. The advantages and disadvantages in the use of and the accuracy of each method are also described. R.J.F.

**N83-23731#** Rockwell International Corp., Golden, Colo. Wind Systems Program.
**COMPARISON OF WIND TURBINE PERFORMANCE PREDICTION AND MEASUREMENT**
James L. Tangler *In* Midwest Research Inst. Proc.: Small Wind Turbine Systems, 1981 1981 p 149-161 refs (For primary document see N83-23722 13-44)
Avail: NTIS HC A19/MF A01

The state-of-the-art of performance prediction for small horizontal-axis wind turbines is discussed. Several existing performance models from four contractors were evaluated by comparing their predictions for two wind turbines with actual test data. Test data were acquired by Rocky Flats Test and Development Center and furnished to the contractors after submission of their prediction reports. The results of the correlation study help identify areas in which existing rotor performance models are inadequate and, where possible, the reasons for the models shortcomings. In addition, several problems associated with obtaining accurate test data are discussed. R.J.F.

**N83-23732#** Aerospace Systems, Inc., Burlington, Mass.
**EFFECTS OF DYNAMIC STALL ON SWECS**
Richard B. Noll and N. D. Ham (MIT) *In* Midwest Research Inst. Proc.: Small Wind Turbine Systems, 1981 1981 p 171-183 refs (For primary document see N83-23722 13-44)
Avail: NTIS HC A19/MF A01

A study of dynamic stall is presented in order to define its influence on the airfoil force and moment coefficients so that these effects can be included in the calculation of small wind energy conversion system (SWECS) loads and responses. A review of past work indicates that semiempirical methods are best suited to SWECS requirements. A definition of a dynamic stall theory is made for use in SWECS design, and the theory is implemented in SWECS loads and dynamic response analyses. Sample calculations are made for a representative vertical-axis machine. It is shown that loads and moments on the blades may be underestimated if dynamic stall is not considered. Author

**N83-23733#** Rockwell International Corp., Golden, Colo. Energy Systems Group.
**EARLY RESULTS FROM THE SWECS ROTOR WAKE MEASUREMENT PROJECT**
A. Craig Hansen *In* Midwest Research Inst. Proc.: Small Wind Turbine Systems, 1981 1981 p 185-199 ref (For primary document see N83-23722 13-44)
Avail: NTIS HC A19/MF A01

Tests were conducted to quantitatively measure the nature and extent of the far wake of a horizontal-axis wind turbine. The tests were conducted at the Department of Transportation, Transportation Test Center in Pueblo, Colorado using controlled velocity tests. Early results presented in this paper show the width and downwind extent of the mean velocity wake. The measured interdependence of the wake strength and SWECS power coefficient is also presented. It is shown that the mean velocity wake is detectable on the wake centerline 14 at rotor diameters from the rotor hub. Author

**N83-23734#** National Conference of State Legislatures, Denver, Colo.
**INTERCONNECTION STANDARDS FOR SMALL POWER PRODUCERS. A SURVEY**
Douglas M. Sacarto *In* Midwest Research Inst. Proc.: Small Wind Turbine Systems, 1981 1981 p 203-218 (For primary document see N83-23722 13-44)
Avail: NTIS HC A19/MF A01

This paper summarizes results from a survey of state utility commissions and selected utility companies regarding their standards for interconnecting small power producers with electric utility systems under the requirements of the Public Utility Regulatory Policies Act. Twenty-six utility companies and the commissions in the fifty states, District of Columbia, Guam, Virgin Islands and Puerto Rico were surveyed. The survey was conducted under a subcontract from the Rocky Flats Wind Systems Program of the Rockwell International Corporation as part of its assessment of institutional barriers to small wind energy systems. Rockwell International is the prime contractor to the United States Department of Energy in the development and commercialization of small wind energy systems. Interconnection standards are concerned with safety standards and liability, metering, payment of costs, and power quality (e.g., voltage regulation, harmonics, synchronization). B.W.

**N83-23735#** Rockwell International Corp., Golden, Colo. Energy Systems Group.
**RESIDENTIAL CONSERVATION SERVICE**
James M. Sherman *In* Midwest Research Inst. Proc.: Small Wind Turbine Systems, 1981 1981 p 219-228 (For primary document see N83-23722 13-44)
Avail: NTIS HC A19/MF A01

The Residential Conservation Services Program is a result of the 1978 National Energy Conservation Policy Act, Public Law 95-619 passed by congress to address the need for energy conservation in the residential sector. Large utility companies and fuel suppliers will be offering audits of their customers' homes to relay technical and economic data about conservation, solar, and wind measures. The impact on utility companies as a result of this program is to offer low cost audits ($15.00 charge for an audit costing approximately $100.00) and to assist their customers in reducing their consumption of electricity, gas, and oil through the use of conservation and renewables. The impact of RCS on wind turbine manufacturers and dealers is an opportunity to participate in a program which provides potential customers.
Author

**N83-23736#** Rockwell International Corp., Golden, Colo. Energy Systems Group.
**FIELD EVALUATION PROGRAM**
Jeffrey L. Pastore *In* Midwest Research Inst. Proc.: Small Wind Turbine Systems, 1981 1981 p 229-236 (For primary document see N83-23722 13-44)
Avail: NTIS HC A19/MF A01

As public interest in alternative energy sources increased, the importance of small wind systems was recognized by the Department of Energy (DOE). Small Wind Energy Conversion Systems (SWECS) connected to an electric utility system offers a good potential for a cost effective use of this energy alternative. DOE initiated a number of programs designed to accelerate the commercialization of wind systems. The Field Evaluation Program has been designed as a part of the federal wind program to accelerate the commercialization process for SWECS. The program goal is to provide near-term resolution of existing technical and institutional constraints in order that wind energy can have the maximum impact on the nation's energy needs. Stimulation of various segments of the SWECS industry will also be a benefit of the program. Author

**N83-23737#** Systems Control, Inc., Palo Alto, Calif.
**OPERATIONS OF SMALL WIND TURBINES ON A DISTRIBUTION SYSTEM**
David Curtice and James Patton *In* Midwest Research Inst. Proc.: Small Wind Turbine Systems, 1981 1981 p 237-250 (For primary document see N83-23722 13-44)
Avail: NTIS HC A19/MF A01

The paper summarizes a study of the technical interconnection problems created by dispersed small wind turbines (WTs). Specific objectives included analysis of: utility personnel safety; distribution system and WT protection equipment; WTs' effects on distribution feeder voltage and regulation equipment, and line losses; and development of a method to analyze utility load-frequency control

problems with load patterns produced by customer demand and the WTs' intermittent power output. Present utility safety procedures require a lock-out disconnect on synchronous generator and self-commutated inverter WTs, and is recommended on induction generator and line-commutated inverter WTs. Radial feeder overcurrent protection equipment coordination was not found to be significantly affected by small WTs. Relays sensing abnormal frequency and voltage are recommended for automatically disconnecting 'islanded' WTs. B.W.

**N83-23738#** Rockwell International Corp., Golden, Colo. Energy Systems Group.
**WIND MACHINE FATIGUE ANALYSIS AND LIFE PREDICTION**
C. A. Waldon *In* Midwest Research Inst. Proc.: Small Wind Turbine Systems, 1981 1981 p 253-269 refs (For primary document see N83-23722 13-44)
Avail: NTIS HC A19/MF A01

Wind machines are, inherently, generators of fatigue. This is true for all types and sizes. Testing at the Rocky Flats Small Wind Systems Test Center has shown that fatigue is the dominant mode of structural failure and its prediction the hardest task for the manufacturer. The objective of this paper is to present a technique, developed by the author, for measuring fatigue and predicting fatigue life for different wind regimes. Presented herein are techniques for locating high stress measuring points, obtaining data, using computer programs for calculating fatigue reduction, and predicting fatigue life. This paper also presents current work which extends the life prediction technique to other wind regimes. Author

**N83-23739#** Rockwell International Corp., Golden, Colo. Energy Systems Group.
**ELECTRICAL SAFETY AND RELIABILITY TESTING AT RF WSTC**
Larry D. States *In* Midwest Research Inst. Proc.: Small Wind Turbine Systems, 1981 1981 p 271-280 (For primary document see N83-23722 13-44)
Avail: NTIS HC A19/MF A01

Two major areas of concern with Small Wind Energy Conversion Systems (SWECS) or other renewable energy systems that wish to interconnect with the existing utility grid have been identified -- electrical safety and reliability and power quality. Manufacturer's efforts to acquire system confidence in promoting safe and reliable SWECS/utility interconnections are discussed. B.W.

**N83-23740#** Northeast Solar Energy Center, Boston, Mass.
**THE WIND PROGRAM AT THE NORTHEAST SOLAR ENERGY CENTER**
Ross L. Bisplinghoff *In* Midwest Research Inst. Proc.: Small Wind Turbine Systems, 1981 1981 p 301-305 (For primary document see N83-23722 13-44)
Avail: NTIS HC A19/MF A01

The Northeast Solar Energy Center, established in 1977, is one of four regional centers created by the Department of Energy to encourage the use of solar technologies to help meet the nation's energy needs. To this end, the Center's staff works closely with state and local governments, community groups, industry, utilities, contractors, architects, engineers, educators and the legal, financial and insurance communities. The nine states (New York, New Jersey, Pennsylvania, and New England) served by NESEC participate directly in its activities through two gubernatorial designees for each state. Also, NESEC funds two solar professionals in each state energy office who form NESEC's Regional Information Network. Author

**N83-23741#** Western Sun, Portland, Oreg.
**REGIONAL SOLAR ENERGY CENTER OVERVIEW: WESTERN SUN**
Michael G. Edds *In* Midwest Research Inst. Proc.: Small Wind Turbine Systems, 1981 1981 p 307-320 (For primary document see N83-23722 13-44)
Avail: NTIS HC A19/MF A01

This paper presents an overview of Western SUN, its general program areas, and specific wind energy projects for fiscal year 1981. Also included is a brief discussion of an important Federal Act that will impact the future electric energy supply of the Northwest; the Pacific Northwest Electric Power, Planning and Conservation Act (1980). Author

**N83-23742#** Service de la Programmation de la Politique Scientifique, Brussels (Belgium).
**NATIONAL RESEARCH AND DEVELOPMENT PROGRAM IN THE ENERGY FIELD Annual Report [PROGRAMME NATIONAL DE R-D DANS LE DOMAINE DE L'ENEGIE]**
24 Jun. 1982 76 p In FRENCH
(PNP/ENE/82/3) Avail: NTIS HC A05/MF A01

Scientific, technological, and economic criteria were established to clarify, in a total context, the choices open to Belgium in meeting the energy crisis and in reducing dependence on foreign sources of fuels and strategic materials. Mathematical models were developed to describe the energy supply and demand in both the industrial and residential sectors. For the period from 1982 to 1987, activities concentrate on analyzing the energy system; determining reasonable use of energy in all sectors; investigating fossil energy and the energetic vectors of substitution and biomass; automating processes for the production of solar cells and the development solar receivers and photovoltaic systems; and recycling and stockpiling strategic materials. A documentation center was established to evaluate national and international research results. Transl. by A.R.H.

**N83-23743#** European Space Agency, Paris (France).
**SOLAR ENERGY 1982: RESOURCES, TECHNOLOGIES, POTENTIAL**
W. R. Burke, comp. Nov. 1982 256 p refs Proc. of Summer School, Igls, Austria, 28 Jul. - 6 Aug. 1982; sponsored by ESA, CNES and DFVLR
(ESA-SP-181; ISSN-0379-6566) Avail: NTIS HC A12/MF A01

The principles of solar energy conversion are reviewed. The feasibility of applying various solar technologies for the provision of heat and the generation of electricity is discussed. The advantages and disadvantages of various solar technologies are also discussed. For individual titles, see N83-23744 through N83-23775.

**N83-23744#** Austrian Solar and Space Agency, Vienna.
**SOLAR TECHNOLOGIES AND POTENTIAL**
Gerhard Faninger *In* ESA Solar Energy 1982: Resources, Technol., Potential Nov. 1982 p 3-9 (For primary document see N83-23743 13-44)
Avail: NTIS HC A12/MF A01

The rapid escalation of energy costs, the depletion of fossil fuel reserves and especially the increase of global energy requirements necessitate the utilization of all sources of energy, especially of renewables. With the present knowledge it could be expected that solar energy can play a significant role in rural areas in the form of decentralized applications. Many of the solar technologies are ready for immediate use in a multiplicity of applications. Other solar technologies are in an advanced stage of research and development and must be demonstrated, in various climatic zones, on a broad scale in order to prove their technical and economic viability. Author

**N83-23745#** Kernforschungsanlage, Juelich (West Germany). Vositzender des Vorstandes.
**ENERGY SITUATION AND SOLAR OPTION**
Wolf Haefele *In* ESA Solar Energy 1982: Resources, Technol., Potential Nov. 1982 p 11-13 refs (For primary document see N83-23743 13-44)
Avail: NTIS HC A12/MF A01

Solar energy as a resource for future energy supply is considered. The energy system is discussed as a whole, paying attention to market penetration mechanisms, and tenacious social infrastructures. Since electricity alone would be insufficient to meet the end users' requirements appropriately, this system supplies hydrogen via a widespread second which completes the functions

of the well established electricity grid. The combination of both extremely clean secondary energies covers the total spectrum of energy applications. B.W.

**N83-23746#** Cologne Univ. (West Germany). Inst. fuer Geophysik und Meteorologie.
**SOLAR RESOURCE**
E. Raschke *In* ESA Solar Energy 1982: Resources, Technology, Potential Nov. 1982 p 17-20 refs (For primary document see N83-23743 13-44)
Avail: NTIS HC A12/MF A01

The downward solar radiation at the Earth's surface is modified by scattering and absorption processes in the atmosphere and the geometry between the positions of the Sun and observer. These principles are outlined in this paper with particular attention to the use of satellite measurements for aerial inventories of available solar energy at ground. Author

**N83-23747#** European Space Agency, Toulouse (France). Meteosat Div.
**METEOROLOGICAL DATA PROVIDED BY SPACE SYSTEMS** **c47**
John Aasted *In its* Solar Energy 1982: Resources, Technol., Potential Nov. 1982 p 21-26 refs (For primary document see N83-23743 13-44)
Avail: NTIS HC A12/MF A01

During the last decade the use of observations from satellites have become part of the weather forecasting procedure. Today, a global system of geostationary satellites provides services and outputs which are applicable not only to weather forecasting but for other disciplines as well. The paper describes the global system, the sensor outputs, the data processing and the data dissemination. Author

**N83-23748#** Centre National de la Recherche Scientifique, Valbonne (France). Lab. d'Ecothermique Solaire.
**STATISTICAL STUDY OF CLIMATIC DATA ADAPTED TO THE SIMULATION OF SOLAR SYSTEMS** **c47**
M. Schneider and X. Berger *In* ESA Solar Energy 1982: Resources, Technol., Potential Nov. 1982 p 27-31 refs (For primary document see N83-23743 13-44)
Avail: NTIS HC A12/MF A01

The methods which lead, from the meteorological data, to the useful quantities for solar building simulations are presented. First of all the solar radiation on any tilted surface must be computed. The weather types are then characterized. Finally are given some recent results on the sky radiation. B.W.

**N83-23749#** Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Stuttgart (West Germany).
**SOLAR THERMAL CONVERSION**
C. J. Winter *In* ESA Solar Energy 1982: Resources, Technol., Potential Nov. 1982 p 35-41 refs (For primary document see N83-23743 13-44)
Avail: NTIS HC A12/MF A01

A systematic description of solar energy utilization on Earth is given. The basic physics of solar energy conversion into heat by means of conduction, convection and radiation are briefly outlined. Examples of existing thermal converters and a list of potential weak-points for future investigations conclude the paper. Author

**N83-23750#** Centre National de la Recherche Scientifique, Valbonne (France). Lab. d'Ecothermique Solaire.
**ACTIVE AND PASSIVE SYSTEMS FOR SOLAR HOUSING**
M. Schneider *In* ESA Solar Energy 1982: Resources, Technol., Potential Nov. 1982 p 43-44 refs (For primary document see N83-23743 13-44)
Avail: NTIS HC A12/MF A01

After a description of the bioclimatic house, the various solutions for passive, active, and integrated solar houses are described. B.W.

**N83-23751#** Technische Univ., Graz (Austria). Inst. fuer Waermetechnik.
**HEAT PUMPS**
Paul Victor Gilli *In* ESA Solar Energy 1982: Resources, Technol., Potential Nov. 1982 p 47-52 refs (For primary document see N83-23743 13-44)
Avail: NTIS HC A12/MF A01

Heat pumps for residential/commercial space heating and hot tap water make use of free energy of direct or indirect solar heat and save from about 40 to about 70 percent of energy if compared to a conventional heating system with the same energy basis. In addition, the electrically driven compressor heat pump is able to substitute between 40% (bivalent alternative operation) to 100% (monovalent operation) of the fuel oil of an oilfired heating furnace. For average Central European conditions, solar space heating systems with high solar coverage factor show the following sequence of increasing cost effectiveness: pure solar systems (without heat pumps); heat pump assisted solar systems; solar assisted heat pump systems; subsoil/water heat pumps; air/water heat pumps; air/air heat pumps. Author

**N83-23752#** Eidgenoessisches Institut fuer Reaktorforschung, Wuerenlingen (Switzerland).
**SOLAR ENERGY AND STORAGE**
Paul Kesselring *In* ESA Solar Energy 1982: Resources, Technol., Potential Nov. 1982 p 53-58 refs (For primary document see N83-23743 13-44)
Avail: NTIS HC A12/MF A01

The contribution consists of two parts. The first one deals with the problem that substituting oil by solar energy implies also to find a long term storage for high quality energy. The conclusion of the rather general discussion is that solar high temperature chemistry, electrochemistry and photochemistry are probably the most important R&D fields to be emphasized in the future. In the second part mostly work done at EIR is presented. The topics sketched are remarks concerning underground heat storage, capacity determination for medium term (days to weeks) hot water storages, the energy density in latent heat storage and a few remarks to the problem of using the grid to store (or buffer) solar (photovoltaic) electricity. Author

**N83-23753#** Technische Univ., Vienna (Austria). Inst. fuer Elektrische Maschinen.
**SYSTEMS WITH MEDIUM AND HIGH TEMPERATURE THERMAL CONVERSION**
Hans F. Kleinrath *In* ESA Solar Energy 1982: Resources, Technol., Potential Nov. 1982 p 61-65 (For primary document see N83-23743 13-44)
Avail: NTIS HC A12/MF A01

Solar thermal power plants are no longer a new technology. Many of their components are so called conventional equipment, some new components are out of their infancy but not yet fully developed. There are several pilot plants, but they are not in operation long enough to speak about routine. First experience does exist, but as usual much of it is just "how to do it furtheron better". The report tries to answer the following questions: what is the state of the art, of which kind are the problems still unsolved, what can be done in order to accelerate further development? Author

**N83-23754#** Ecole Centrale des Arts et Manufactures, Chatenay-Malabry (France). Groupe d'Evaluation des Systemes Energetiques Renouvelables.
**SOLAR POWER TOWERS**
M. C. Etievant *In* ESA Solar Energy 1982: Resources, Technol., Potential Nov. 1982 p 67-78 refs In FRENCH (For primary document see N83-23743 13-44)
Avail: NTIS HC A12/MF A01

Experimental solar power towers actually in construction or already in existence in the world are described. Seven of these installations are examined: three involve water vapor with solar superheating (EURELIOS, CESA 1, SOLAR ONE); two involve saturated water vapor (NIO, CES 5); one involves sodium (SSPS, CRS), and one molten salt (TEMIS). The principal characteristics of these receivers are presented as well as some results of

economic studies of heliostat construction and the cost of electricity. A.R.H.

**N83-23755#** Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Abteilung Power Systems.

**DISTRIBUTED COLLECTOR SYSTEMS (DCS) FOR THE MEDIUM TEMPERATURE RANGE**

Andreas C. Kalt *In* ESA Solar Energy 1982: Resources, Technol., Potential Nov. 1982 p 81-87 (For primary document see N83-23743 13-44)

Avail: NTIS HC A12/MF A01

The basic layout of a distributed collector system (DCS) is described and questions concerning design are discussed. Plant designs and performance data for four DCS systems are presented. Energy storage techniques, the power conversion cycle, and heat transfer subsystems are addressed. M.G.

**N83-23756#** Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Stuttgart (West Germany). Inst. fuer Technische Physik.

**SMALL INTEGRATED SOLAR ENERGY SYSTEMS FOR DEVELOPING COUNTRIES**

Konrad R. Schreitmueller *In* ESA Solar Energy 1982: Resources, Technol., Potential Nov. 1982 p 89-95 refs (For primary document see N83-23743 13-44)

Avail: NTIS HC A12/MF A01

Solar enegy applications in developing countries cover processing of food and other agricultural products, fresh water production, operation of cooling and freezing equipment, of water pumps and processing machinery. Evacuated tubular collectors turn out to be best suited for process heat generation; photovoltaic generators for electricity production. The Mexican fisher village of Las Barrancas gives a good example of an integrated solar energy system. Author

**N83-23757#** Stuttgart Univ. (West Germany). Inst. fuer Physikalische Elektronik.

**PHOTOVOLTAIC ENERGY CONVERTERS: FUNDAMENTALS AND ADVANCED CONCEPTS**

W. H. Bloss *In* ESA Solar Energy 1982: Resources, Technol., Potential Nov. 1982 p 99-103 (For primary document see N83-23743 13-44)

Avail: NTIS HC A12/MF A01

The basic physics of photovoltaic energy conversion devices based on semiconductors is outlined. The significant role of the solar spectrum and of the material parameters absorption coefficient and diffusion length of the semiconductors as well as the consequences with respect to material selection are discussed. The potentials of conventional flat plate and concentrating systems and the special advantages of advanced systems such as tandem configurations and those including dispersive and concentrating elements are outlined. Author

**N83-23758#** Centre National de la Recherche Scientifique, Meudon (France).

**SILICON SOLAR CELLS FOR FLAT PLATE PHOTOVOLTAIC SYSTEMS**

M. Rodot *In* ESA Solar Energy 1982: Resources, Technol., Potential Nov. 1982 p 105-110 refs (For primary document see N83-23743 13-44)

Avail: NTIS HC A12/MF A01

The best cost effective solar cells (8 to 10 watt) are made of crystalline silicon. Their evolution is based on the emergence of a new material, solar grade Si, which is less pure and perfect than the electronic grade material used today. The physics, chemistry, and crystal growth aspects of solar grade Si are discussed. Together with other improvements, this material allows a cost of 3 to 4 $/watt in 1985 and brings photovoltaic generators in close competitivity with diesel engines. Amorphous Si is also briefly mentioned. Author

**N83-23759#** Centre National d'Etudes Spatiales, Paris (France).

**CONCENTRATING PHOTOVOLTAIC SYSTEMS**

Alain Dupas *In* ESA Solar Energy 1982: Resources, Technol., Potential Nov. 1982 p 113-121 (For primary document see N83-23743 13-44)

Avail: NTIS HC A12/MF A01

Various configurations for concentrating photovoltaic systems are described and their operating principles are explained. The effects of temperature and series resistance on system efficiency are discussed. As an example, the french family of photovoltaic concentrating systems, SOPHOCLE, is described. The SOPHOCLE family of generators is characterized by the use of a heliostat with altazimuth mounting and by the choice of medium concentration (C=45) by fresnel lenses on silicon cells. M.G.

**N83-23760#** European Space Research and Technology Center, Noordwijk (Netherlands). Solar Generators Section.

**PHOTOVOLTAIC TESTING**

Klaus Bogus *In* ESA Solar Energy 1982: Resources, Technol., Potential Nov. 1982 p 123-133 refs (For primary document see N83-23743 13-44)

Avail: NTIS HC A12/MF A01

Commonly used performance tests covering indoor and natural sunlight methods are reviewed. The historical and rational background of these methods is depicted and the experience gained at ESTEC in the frame of space and terrestrial programs is described. Moreover, the general objectives and requirements for environmental tests are discussed. Finally, typical examples for environmental test schedules are presented for space solar cells and terrestrial solar cell modules. M.G.

**N83-23761#** AEG-Telefunken, Wedel (West Germany).

**PHOTOVOLTAIC APPLICATIONS**

Heinz Groth *In* ESA Solar Energy 1982: Resources, Technol., Potential Nov. 1982 p 135-145 refs (For primary document see N83-23743 13-44)

Avail: NTIS HC A1/MF A01

The utilization of photovoltaic generators in measuring and signalling installations, communication systems, water pumping, and electric power plants is discussed. The advantages of solar generators over conventional power supply equipment are outlined. M.G.

**N83-23762#** Joint Research Centre of the European Communities, Ispra (Italy).

**ON THE ECONOMICS OF SOLAR ELECTRICITY GENERATION**

Joachim Gretz *In* ESA Solar Energy 1982: Resources, Technol., Potential Nov. 1982 p 147-148 (For primary document see N83-23743 13-44)

Avail: NTIS HC A12/MF A01

The development of solar electricity cost models is discussed. In view of the large scattering of component and total plant investment costs, differences in mode of cost calculation, and uncertainty of the solar utilization factor refined cost calculations do not give any more useful information than simple formulae. The competitiveness of solar electricity is addressed with reference to cost projections. M.G.

**N83-23763#** Aix-Marseilles Univ. (France). Inst. d'Administration des Entreprises.

**SOCIO-ECONOMICS OF SOLAR ENERGY**

Pierre Andre Buigues *In* ESA Solar Energy 1982: Resources, Technol., Potential Nov. 1982 p 151-157 refs (For primary document see N83-23743 13-44)

Avail: NTIS HC A12/MF A01

The economic and social status of new and renewable energy sources in the United States and in France is described. The roles of different strategic agents (companies and government) in developing and using these energy resources is also outlined. Author

**N83-23764#** International Inst. for Applied Systems Analysis, Laxenburg (Austria).

**TWO ALTERNATIVE SOLAR ENERGY SCENARIOS FOR WESTERN EUROPE**
Nebojsa Nakicenovic *In* ESA Solar Energy 1982: Resources, Technol., Potential Nov. 1982 p 159-163 refs (For primary document see N83-23743 13-44)
Avail: NTIS HC A01/MF A01

Two limiting scenarios that lead to a sustainable energy system in Western Europe toward the end of the next century are described. The scenarios consider exclusively solar energy futures: one based on centralized solar technologies (hard scenario) and the other on decentralized user-oriented technologies (soft scenario). While both scenarios eliminate Western Europe's dependence on domestic and foreign fossil energy sources, the hard solar scenario requires substantial imports of solar produced hydrogen. Fundamental but different changes of the whole energy system, economic structure and lifestyles are necessary in order to achieve sustainable solar energy futures in the scenarios. M.G.

**N83-23765#** Halcrow (William) and Partners, Swindon (England).
**PHOTOVOLTAIC APPLICATIONS IN EUROPE: SYSTEM ECONOMICS AND MARKET PROSPECTS**
M. R. Starr *In* ESA Solar Energy 1982: Resources, Technol., Potential Nov. 1982 p 165-170 refs (For primary document see N83-23743 13-44)
Avail: NTIS HC A12/MF A01

After reviewing the prospects for cost reduction, the economics of electricity generation by photovoltaics in comparison with conventional alternatives are discussed. The important influence of various financial incentives for purchasers is demonstrated. Economic analyses are also presented for small-scale stand-alone photovoltaic systems for pumping and refrigeration. Finally, the market prospects for photovoltaic applications in Europe are reviewed, on the assumption that this technology is given official support and encouragement by national governments, electricity utilities and private investors. R.J.F.

**N83-23766#** Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Stuttgart (West Germany). Inst. fuer Technische Physik.
**HYDROGEN TECHNOLOGY**
Walter Peschka *In* ESA Solar Energy 1982: Resources, Technol., Potential Nov. 1982 p 173-178 refs (For primary document see N83-23743 13-44)
Avail: NTIS HC A12/MF A01

The elements of an energy economy based mainly on hydrogen are discussed. Large scale production of non-fossile hydrogen from nuclear and solar energy; long-distance transport on an international scale including the associated possibilities of decoupling production and consumption; storage and distribution at home including the various types of coupling possible during conversion; and the use of hydrogen as an energy carrier in the various consumer sectors are discussed. Use of chemicals, iron and steel, in the upgrading of fossile energy carriers and in the production of synthetic liquid hydrocarbons is also discussed. R.J.F.

**N83-23767#** Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Stuttgart (West Germany). Research Dept.
**LARGE SCALE SOLAR ENERGY UTILIZATION POSSIBILITIES AND RESTRICTIONS**
Joachim Nitsch *In* ESA Solar Energy 1982: Resources, Technol., Potential Nov. 1982 p 179-184 refs (For primary document see N83-23743 13-44)
Avail: NTIS HC A12/MF A01

The basic problems of producing hydrogen and introducing it into our energy system are described. It is discussed in what time and under which conditions solar hydrogen can make an essential contribution to our energy economy. Solar thermal and photovoltaic power plants for the electrolytic production of hydrogen are described. Typical values for the amount of the financial investment as well as for the raw material requirements are given. It is concluded that sizeable portion (up to 50%) of our energy could be supplied by solar hydrogen in the year 2030. R.J.F.

**N83-23768#** Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Advanced Programs Div.
**OTHER MEANS FOR DIRECT AND INDIRECT USE OF SOLAR ENERGY**
Wilfried Ley *In* ESA Solar Energy 1982: Resources Technol., Potential Nov. 1982 p 185-190 refs (For primary document see N83-23743 13-44)
Avail: NTIS HC A12/MF A01

The direct and indirect uses of solar energy are discussed. Indirect solar energy conversion like wind, wave and tides, water flows or elevated water, ocean thermal and biological materials are considered. All of them are of interest today as possible future energy sources primarily because of their nondepletable character and their favorable environmental aspect, in comparison with energy technologies presently in use. R.J.F.

**N83-23769#** European Space Research and Technology Center, Noordwijk (Netherlands). Systems Engineering Dept.
**SOLAR POWER SATELLITES: A REVIEW OF THE STATE OF RESEARCH**
Dieter Kassing *In* ESA Solar Energy 1982: Resources, Technol., Potential Nov. 1982 p 191-197 refs (For primary document see N83-23743 13-44)
Avail: NTIS HC A12/MF A01

Main results of the recently completed Solar Power Satellite concept development and evaluation studies in the U.S. and of additional studies in Europe are reviewed in respect to the technical feasibility, economic practicality, and social and environmental acceptability of the concept. Possible consequences for Europe for future research and development in related areas are discussed. Emphasis is given to the photovoltaic reference system used as a strawman concept in the U.S. comparative assessment. Some other advanced photovoltaic satellite concepts with promising benefits against the reference system are also reported. R.J.F.

**N83-23770#** European Space Agency, Paris (France).
**ROUND TABLE DISCUSSION ON THE FUTURE OF SOLAR ENERGY**
A. S. Strub, W. H. Bloss, M. Claverie, Gerhard Faninger, and C. J. Winter *In its* Solar Energy 1982: Resources, Technol., Potential Nov. 1982 p 201-204 (For primary document see N83-23743 13-44)
Avail: NTIS HC A12/MF A01

The future of solar energy technology in industrialized countries and developing nations was discussed. Solar technologies were compared. Policies, trends, and efforts in various countries were discussed. A review of photosynthesis was given. R.J.F.

**N83-23771#** Centre National de la Recherche Scientifique, Valbonne (France). Groupe d'Ecothermique Solaire.
**WORKSHOP 1: PASSIVE SOLAR SYSTEMS**
M. Schneider and Konrad R. Schreitmueller (DFVLR, Stuttgart) *In* ESA Solar Energy 1982: Resources, Technol., Potential Nov. 1982 p 207-214 (For primary document see N83-23743 13-44)
Avail: NTIS HC A12/MF A01

The design of a solar house for a latitude of 50 degrees north in Northern Europe is discussed. An evaluation of a 500 cubic meter house and a computerized simulation of a 350 cubic meter house are given. It was found that the heating demand of a poorly insulated house may be decreased by 70 to 75% by means of an extensive insulation; new buildings should be extensively insulated; passive solar energy utilization is usually not cost effective. R.J.F.

**N83-23772#** Austrian Solar and Space Agency, Vienna.
**WORKSHOP 2: OPTIMIZATION OF SOLAR HEATING SYSTEMS**
Manfred Bruck *In its* Solar Energy 1982: Resources, Technol., Potential Nov. 1982 p 215-220 refs (For primary document see N83-23743 13-44)
Avail: NTIS HC A12/MF A01

The life cycle cost method was used to investigate the solar domestic hot water preparation economic sensitivity in Austria,

the Federal Republic of Germany and France. The life cycle savings of a solar heating system over a conventional heating system are expressed as the difference between a reduction of conventional fuel costs and an increase in expenses incurred as a result of the additional investment for the collector system. R.J.F.

**N83-23773#** Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany).
**WORKSHOP 3: CENTRAL RECEIVER SYSTEMS**
Manfred Becker, M. C. Etievant (Ecole Centrale des Arts et Manufactures), and Joachim Gretz (Joint Research Centre of the European Communities) *In* ESA Solar Energy 1982: Resources, Technol., Potential Nov. 1982 p 221-223 (For primary document see N83-23743 13-44)
Avail: NTIS HC A12/MF A01

The basic design data is given for a 5 MW sub el solar thermal power tower. Specifications are for the geographical and meteorological conditions of Almeria, Spain. The objectives were to consider the total system, to understand contexts and possible options, to discuss technical consequences, and finally to decide upon reasonable solutions. R.J.F.

**N83-23774#** European Space Agency, Paris (France).
**WORKSHOP 4: DESIGN OF A 100 kWe DCS SOLAR POWER PLANT**
*In* ESA Solar Energy 1982: Resources, Technol., Potential Nov. 1982 p 227-230 refs (For primary document see N83-23743 13-44)
Avail: NTIS HC A12/MF A01

The design of a 100 kWe solar generator is discussed. The rough design of the steam circuit is discussed, as is the choice of a temperature range for the collector and storage medium. The layout of the collector field and heat storage tanks are given. Heat losses are calculated. R.J.F.

**N83-23775#** Centre National de la Recherche Scientifique, Lyon (France). Dept. de Physique des Materiaux.
**WORKSHOP 5: DESIGN OF A PHOTOVOLTAIC GENERATOR FOR A REFUGE IN THE ALPS**
J. A. Roger *In* ESA Solar Energy 1982: Resources, Technol., Potential Nov. 1982 p 231-234 refs (For primary document see N83-23743 13-44)
Avail: NTIS HC A12/MF A01

The design of a photovoltaic (PV) generator for a refuge located in the mountains (+5 deg north, 4 deg east) at an altitude of 2600 m is discussed. This refuge has a capacity of 90 persons and is not connected to the grid. it is at present equipped with a 14 kVa diesel generator operating in a three phase plus neutral mode. This group provides electricity to various domestic appliances: lighting, heat (in the keeper's room), refrigeration, water pumping, etc. Starting from available documents and data, the task was to design the PV generator to be substituted for this diesel engine. The work was divided in several steps: analysis of the existing loads and of the corresponding consumptions; estimation of the solar energy available on the site; choice of the PV chain necessitating as few modifications as possible in the existing installation; sizing of the elements of the PV chain and scheme of the various parts; and modifications that can be done regarding the loads, and related changes in the design of the system. R.J.F.

**N83-23776#** Technische Univ., Berlin (West Germany). Fachgebeit: Brennstofftechnik.
**ENERGY SAVING INCINERATION OF WASTE Final Report, May 1981**
Heinz MeierzuKoecker and Richard Voegtli Bonn Bundesministerium fuer Forschung und Technologie Nov. 1982 76 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-194; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Ger. DM 16

The machanism and the dimension of the preoxidation of the pollutants in the heat exchanger were investigated. A temperature control system was developed and tested. It is found that the preoxidation in the heat exchanger depends on the peculiarity of the pollutants and is inhibited by inactive walls with increasing of the specific surface. Active materials like copper only promote the oxidation of all pollutants in the low temperature region. Savings of supplemental energy about 25% are possible using process controlled auxiliary firing and combustion enthalpy of pollutants as a substitute for the supplemental energy. E.A.K.

**N83-23777#** Gesellschaft fuer Industriewaerme und Verfahrenstechnik m.b.H., Krefeld (West Germany).
**RECUPERATION OF WASTE HEAT FROM FLUE GASES CONTAINING SOLID PARTICLES AND CORROSIVE CHEMICALS AT HIGH TEMPERATURES Final Report, May 1981**
Ulrich Trappe Bonn Bundesminiterium fuer Forschung und Technologie Nov. 1982 127 p refs In GERMAN; ENGLISH summary Sponsored by Bundesminiterium fuer Forschung und Technologie
(BMFT-FB-T-82-195; ISSN-0340-7608) Avail: NTIS HC A07/MF A01; Fachinformationszentrum, Karlsruhe, West Ger. DM 26,50

Heat recuperation which is the heating up of combustion air by the heat of flue gases were examined. The research project included: development of the mathematical models and computer programs for complete systems of cassette recuperators; practical trials and measuring of performance data of a cassette recuperator installed at two soaking pit chambers long term test fo determination of life expectance. It is found that cassette recuperators have under comparable conditions a life time of three years and are more economical than convective recuperators. Protective layers on the heat resisting sheets, promise a rise of durability of 50 to 100%. Cassett recuperators are installed at approx. 20 soaking pit chambers in the steel industry. E.A.K.

**N83-23778#** Maschinenfabrik Augsburg-Nuernberg A.G., Munich (West Germany). Abt. EPS.
**SOLAR THERMAL POWER PLANT 30/50 kWe. GERMAN-SPANISH COOPERATION PROJECT AUXINI/M.A.N. Final Report, Feb. 1982**
Michael Kraft Bonn Bundesministerium fuer Forschung und Technologie Nov. 1982 48 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-198; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Ger. DM 10

The development of solar farm plants is discussed. A test site was built containing a testhouse, street, workshop and sufficient measurement equipment. In 1980 the test site was increased to 18.000 sq m and an additional office building was erected. The installed Solar Thermal Power Plant consists of three collector fields with a total collector area of 582 sq m a tankfarm storage system, with a capacity of 1,15 MWh th. at a temperature increment of 100 K, the primemover circuit with a screw expander about 50 KWe peakpower output and the control and supervision system. The tests are concentrated on components and the system for the production of thermal energy, which will be applied to industrial processes. E.A.K.

**N83-23779#** Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany). Bereich Sondertechnik.
**WIND ENERGY CONVERTER WITH HIGH-SPEED VERTICAL AXIS ROTOR AND STRAIGHT ROTOR BLADES Final Report, Sep. 1980**
Gerd Zelck Bonn Bundesministerium fuer Forschung und Technologie Nov. 1982 107 p In GERMAN; ENGLISH summary Ponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-201; ISSN-0340-7608) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Ger. DM 22,50

Complete documents for a wind energy converter with a vertical axis rotor and straight blades (H-rotor) were developed. The

2 blade rotor with rigid and rectangular air foils in wooden construction reaches the nominal output of 75 KVA from 11,4 m/sec. wind velocity onwards. The development activities are supported by wind tunnel and component tests. The final design selected was based upon previous development work. Trade offs show that the design is more advantageous compared to other designs. The use of wood as a material for the rotary and horizontal blade supports gives positive result. E.A.K.

**N83-23780#** Deutsche Forschungsanstalt fuer Hubschrauber und Vertikalflugtechnik, Stuttgart (West Germany). Inst. fuer Bauwesen- und Konstruktionsforschung.

**DEVELOPMENT OF A WIND ENERGY CONVERTER AND INVESTIGATION OF ITS OPERATIONAL FUNCTION. PART 1: TECHNICAL DESCRIPTION OF THE WIND ENERGY CONVERTER Final Report, Apr. 1981**

Jens-Peter Molly and Rainer Steinheber Bonn Bundesministerium fuer Forschung und Technologie Nov. 1982 60 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie 4 Vol.

(BMFT-FB-T-82-204; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Ger. DM 12,50

A 10 kW wind energy converter was developed by using as far possible standard serial production parts. The design criteria and the description of the essential machinery components of the MODA 10 wind energy converter are discussed. For some special load cases the safety calculation of the important components is shown. The blade control system which qualified for small wind energy converters, is explained. Weight and cost of the MODA 10 are considered. S.L.

**N83-23781#** Deutsche Forschungsanstalt fuer Hubschrauber und Vertikalflugtechnik, Stuttgart (West Germany). Inst. fuer Bauwesen- und Konstruktionsforschung.

**DEVELOPMENT OF A WIND ENERGY CONVERTER AND INVESTIGATION OF ITS OPERATIONAL FUNCTION. PART 2: AERODYNAMICS AND CALCULATION OF LOADS Final Report, Apr. 1981**

Alfred Kussmann, Otto Storm, and Wolfgang Weber Bonn Bundesministerium fuer Forschung und Technologie Dec. 1982 62 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie 4 Vol.

(BMFT-FB-T-82-205; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Ger. DM 13

The optimum design approach to wind rotor blades, and the special blade design to fit with a 10 kW horizontal axis wind energy converter are shown. The calculated performance data are given in power/blade pitch angle and c sub p/lambda diagrams. According to a set of defined load cases, critical load conditions were considered. Results of these load computations are presented as time history graphs and as wind velocity related diagrams, serving as basic data in component structural design. S.L.

**N83-23782#** Deutsche Forschungsanstalt fuer Hubschrauber und Vertikalflugtechnik, Stuttgart (West Germany). Inst. fuer Bauwesen- und Konstruktionsforschung.

**DEVELOPMENT OF A WIND ENERGY CONVERTER AND INVESTIGATION OF ITS OPERATIONAL FUNCTION. PART 3: DESIGN OF THE ROTORBLADE, PRODUCTION AND LOADING TESTS Final Report, Apr. 1981**

Dieter Muser and Tanno Preuss Bonn Bundesministerium fuer Forschung und Technologie Dec. 1982 171 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie 4 Vol.

(BMFT-FB-T-82-206; ISSN-0340-7608) Avail: NTIS HC A08/MF A01; Fachinformationszentrum, Karlsruhe, West Ger. DM 33,50

The development of the rotor blade, its production and the loading tests are discussed. First the load assumptions are defined and different possibilities for the construction of the blade attachment and the blade itself are studied. Several rotor blades with partial different structural design characteristics were produced and investigated in extensive loading tests. Additionally tests were carried out on static vibration behavior, lightning protection, impact behavior and temperature measurements. A rotor blade for the 10 kW-wind energy converter was investigated. S.L.

**N83-23783#** Deutsche Forschungsanstalt fuer Hubschrauber und Vertikalflugtechnik, Stuttgart (West Germany). Inst. fuer Bauwesen- und Konstruktionsforschung.

**DEVELOPMENT OF A WIND ENERGY CONVERTER AND INVESTIGATION OF ITS OPERATIONAL FUNCTION. PART 4: TEST SETUP AND RESULTS OF MEASUREMENT Final Report, Apr. 1981**

Sepp Armbrust and Jens-Peter Molly Bonn Bundesministerium fuer Forschung und Technologie Dec. 1982 48 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie 4 Vol.

(BMFT-FB-T-82-207; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Ger. DM 10

Measurements made during test operations at the MODA.10 plant as well as at a 25 years old 6 kW wind energy converter are presented. The test arrangements, measurement results of both wind energy converters, and the experience gained are described. S.L.

**N83-23784#** Internationale Atomreaktorbau Gesellschaft, Bensberg (West Germany).

**GAS-COOLED SOLAR TOWER POWER PLANT FOR THE GENERATION OF ELECTRICAL POWER IN THE RANGE OF 20 MW (GAST). (DETAIL DESIGN PHASE 2A) Final Report, Nov. 1981**

Peter Wehowsky Bonn Bundesministerium fuer Forschung und Technologie Dec. 1982 35 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-T-82-208; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Ger. DM 7,50

The detail design phase of a 20 MWe gas cooled solar tower power plant (GAST) was examined. The goal of phase 2/2A was the detail engineering and design of the reference concepts of plant system and subsystems developed within the preliminary design phase and to start test work required for the erection of the pilot plant. The construction of a pilot plant, originally planned to be finished within a very short time, can not be continued. E.A.K.

**N83-23785#** Dornier-Werke G.m.b.H., Friedrichshafen (West Germany). Neue Technologien Energietechnik.

**PROTOTYPE DEVELOPMENT FROM A 10 kW SMALL SOLAR POWER PLANT. PHASE 3A Final Report, Dec. 1981**

Josef Haenfling and Roland Veigel Bonn Bundesministerium fuer Forschung und Technologie Dec. 1982 113 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-T-82-209; ISSN-0340-7608) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Ger. DM 24

The prototype development modification of a small solar power plant in Cairo, Egypt is described. The following stages are discussed: introduction and supervising of the Egyptian mechanical engineers and technicians; integration and testing of the screw expansion engine; fitting and optimization of the regulating system; planning for the further application of the small solar power plant; and planning for the comprehensive training program solar power plant in Cairo for engineers, technicians and mechanicians. E.A.K.

**N83-23786#** Ruhrkohle Oel und Gas G.m.b.H., Bottrop (West Germany).

**PLANNING, CONSTRUCTION AND OPERATION OF THE 35 MW SUB TH-TEST FACILITY FLINGERN FOR FIRING BITUMINOUS COAL IN AN ATMOSPHERIC FLUIDIZED BED FURNACE Final**

Report, Nov. 1981
Hermann Gottfried Krischke, Rolf Werner Chalupnik, and Heinz Peter Masuch Bonn Bundesministerium fuer Forschung und Technologie Nov. 1982 113 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-212; ISSN-0340-7608) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Ger. DM 24

Clean combustion of high ash and high sulfur coal with the boiler, retrofitted from traveling grate stoker to FBC was demonstrated. Within 4,200 operating hours 14,500 t of bituminous coal ranking from high grade to low grade were fired, generating 105,000 t of steam at 17 bar and 400 C. During the 18 month test operation important knowledge concerning process and systems to burn coal in the fluidized bed were gained. The technical feasibility in industrial scale was demonstrated. S.L.

**N83-23787#** Flachglass A.G. DELOG-DETAG, Gelsenkirchen (West Germany). Beschichtungslabor.
**DEVELOPMENT OF A SELECTIVE THIN FILM AND OF A HERMETICALLY SEALED FLAT PLATE SOLAR COLLECTOR WITH GAS FILLING Final Report, Dec. 1980**
Wolfgang Zernial Bonn Bundesministerium fuer Forschung und Technologie Dec. 1982 91 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-214; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Ger. DM 19

The industrial productibility of a selective absorbing thin film was investigated on the basis of reactive cathodic sputtering of Ni. On substrates of 1.8 sq m of Al, Cu, steel and stainless steel, solar absorption values up to 97% were achieved at emissivities of 5 to 10%. A prototype flat plate collector for high temperatures with two covers and hermetical sealing was developed. The technical data of the collector were measured, dependent on the selectivity of the absorber, gas fillings of dry air, argon or SF6 and the geometry and were compared with those of an evacuated flat plate collector. A hermetical sealed double flat plate collector for low temperatures was developed which has the advantage of lower no load temperatures and higher energy gain for heating swimming pool water compared with a conventional flat plate collector. The insolation values on collectors were measured and were used for a calculation of the energy gains of different collector types. S.L.

**N83-23788#** Arbeitsgemeinschaft Plenar Niedertemperatur-Waermeverbund G.m.b.H., Frankfurt (West Germany).
**LOW TEMPERATURE INDUSTRIAL WASTE HEAT UTILISATION IN THE AREA. SPEYER-LUDWIG-SHAFEN-FRANKENTHAL-WORMS Final Report, Jul. 1981**
Karl Nunold and Andreas Krebs Bonn Bundesministerium fuer Forschung und Technologie Dec. 1982 311 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie Original contains color illustrations
(BMFT-FB-T-82-215; ISSN-0340-7608) Avail: NTIS HC A14/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 48

The economical conditions utilize low temperature industrial waste heat systems for heating purposes were examined waste heat are provided by power and industrial plants. A number of application possibilities for heat pumps are shown and it is evident that there is a high variation of the heat requirement due to social components and the different type of building structures. The economic results show that the application of this heating system can supplement or replace other heating systems. E.A.K.

**N83-23789#** Scheven Ingenieure G.m.b.H., Duesseldorf (West Germany). Planungsgesellschaft fure Wasser- und Abfallwirtschaft mbH.
**STUDY FOR HEAT RECOVERY FROM WASTE WATER AND UTILIZATION POSSIBILITIES ILLUSTRATED BY USING THE EXAMPLE OF THE CITY OF LEMGO Final Report, Nov. 1981**
Michael Gassen and Dirk Hunke Bonn Bundesministerium fuer Forschung und Technologie Dec. 1982 95 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-235; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformations-zentrum, Karlsruhe, West Germany DM 20

The amount of heat contained in municipal waste water and the possibilities of recovering it were investigated. The effects of heat removal on the waste water treatment efficiency was discussed. The basic condition for the conceived process is that the heat is directly removed, i.e., without special conditioning, and brought to an adequate temperature level for use in the heat supply system via the heat pumps. Various possibilities for the use of heat contained in waste water were studied. The savings of primary energy is considerable compared with conventional heating systems. Nevertheless, the feasibility study carried out shows no savings in yearly costs as compared with conventional heating systems. S.L.

**N83-23790#** Kraftwerk Union A.G. Reaktortechnik, Erlangen (West Germany). Aktiengesellschaft.
**INCREASE OF THE OVERALL PLANT EFFICIENCY AND ELECTRICAL POWER OF EXISTING STEAM TURBINE POWER PLANTS BY CONVERSION TO COMBINED GAS AND STEAM CYCLE POWER PLANTS Final Report, Feb. 1982**
Anton Knipfer Bonn Bundesministerium fuer Forschung und Technologie Dec. 1982 205 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-237; ISSN-0340-7608) Avail: NTIS HC A10/MF A01; Fachinformations-zentrum, Karlsruhe, West Germanyu DM 36

In the case of a combined gas and steam cycle power plant in which an existing steam turbine is connected to a gas turbine, the GT exhaust heat may be utilized in the steam turbine. Two possibilities are investigated for the utilization of this exhaust heat. Either the exhaust gas preheats the feedwater of the steam turbine cycle or it is used in the boiler as combustion air. The findings indicate that overall plant efficiency can be increased by up to 4% as compared with the separate arrangement of gas turbine and steam turbine plants. The power gain is as much as 15%. The calculation of economic effectiveness indicates that only the variant incorporation exhaust gas preheating of the feedwater is economically effective. S.L.

**N83-23791#** Cube Ingenieurunion G.m.b.H., Worms (West Germany).
**CHARACTERISTICS OF EXHAUST AIR FACADES AS SOLAR ABSORBERS FOR SAVING OF HEATING ENERGY Final Report, Oct. 1981**
Hans Ludwig vonCube and Edgar Ludwig Bonn Bundesministerium fuer Forschung und Technologie Dec. 1982 206 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-245; ISSN-0340-7608) Avail: NTIS HC A10/MF A01; Fachinformatonszentrum, Karlsruhe, West Germany DM 37

The solar radiation exploited by solar exhaust air windows was measured at a building facing four main directions. The windows were not constructed as optimal radiation absorbers and the heat gain stood in a range of 3 to 10% of the heat consumption, depending on time of year. Optimal windows (chiefly clear glass with Venetian blinds) were found by a computer program simulating the process of radiation in an exhaust air-window and heat gains up to 50% can be obtained. Relation to air flow rate and others were found. The calculated results were proved by measurements. With a suitable heating systems in the building (heat transport form south side to north side, heat storage) up to 50% of the annual consumption can be saved. E.A.K.

**N83-23792#** Aerospace Corp., El Segundo, Calif. Chemistry and Physics Lab.
**CHARGE EFFICIENCY AND CHARGE UTILIZATION IN THE SEALED NICKEL-CADMIUM CELL**
Albert H. Zimmerman and Peter K. Effa Los Angeles Air Force Space Div. 20 Dec. 1982 23 p refs
(Contract F04701-82-C-0083)
(AD-A122907; TR-0083(3945-01); SD-TR-82-91) Avail: NTIS HC A02/MF A01 CSCL 10/3

The charge efficiency of the nickel-cadmium cell is found to be 100% up to the state of charge where oxygen evolution begins to take place. Inefficiencies at lower states of charge are due to poor utilization of capacity on discharge rather than to any inefficiency in rechargability. The dependence of the utilization efficiency on charge and discharge rates is reported. The results are consistent with the hypothesis that the utilization of capacity in the nickel electrode is limited by the formation of a depletion layer at the current collector-active material interface.
Author (GRA)

**N83-23793#** Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
**ADVANCED, HIGH-TEMPERATURE MOLTEN-SALT STORAGE**
R. J. Copeland Aug. 1982 8 p refs Presented at the Energy Storage Contractors' Rev. Meeting, Washington, D.C., 23-26 Aug. 1982
(Contracts DE-AC02-76CH-00178; EG-77-C-01-4042)
(DE82-020852; SERI/TP-252-1684; CONF-820827-23) Avail: NTIS HC A02/MF A01

Advanced molten salts (hydroxides, carbonates, and chlorides) are being researched fo solar thermal applications. These salts may be used in both the receiver working fluid and in thermal energy storage. Potential applications include electric power production, fuel and chemical production, and high-temperature process heat. Molten salts can store sensible heat at temperatures up to 1100 C in a thermocline system with a unique insulating platform (raft) that floats between the hot and cold molten salts. Overall solar economic potential of the systems is assessed. In current research, the performance of insulating raft thermocline is being tested and materials compatibility is being studied. DOE

**N83-23794#** Kepling and Associates, Inc., Tulsa, Okla.
**THE IMPACT OF GEOLOGIC PARAMETERS ON ENHANCED OIL RECOVERY: WORKSHOP PROCEEDINGS**
Michael Peterson, comp. May 1982 46 p refs Workshop held in Tulsa, Okla., 15-16 Oct. 1981
(DE82-012436; CONF-8110160) Avail: NTIS HC A03/MF A01

Reservoir anatomy and additional oil recovery, rock-fluid interactions, reservoir heterogeneity, reservoir description and instrument technology, and geologic input into EOR simulation techniques are discussed. For individual titles, see N83-23795 through N83-23800.

**N83-23795#** Texas Univ., Austin. Bureau of Economic Geology.
**RESERVOIR ANATOMY AND ADDITIONAL OIL RECOVERY**
William L. Fisher *In* Keplinger and Associates, Inc. The Impact of Geol. Parameters on Enhanced Oil Recovery May 1982 p 8-13 (For primary document see N83-23794 13-44)
Avail: NTIS HC A03/MF A01

The ability to take detailed reservoir data and reconstruct in three dimensions the anatomy of a reservoir, that is, to define the plumbing of flow paths within the reservoir are addressed. Author

**N83-23796#** Kepling and Associates, Inc., Tulsa, Okla.
**ROCK-FLUID INTERACTION WORKSHOP**
*In its* The Impact of Geol. Parameters on Enhanced Oil Recovery May 1982 p 14-18 (For primary document see N83-23794 13-44)
Avail: NTIS HC A03/MF A01

Research areas relating geologic studies to an improved understanding of the various EOR processes and their interaction with reservoir minerals are discussed. Of primary concern were the interactions of EOR fluids with the pore surfaces within the reservoir rock.
Author

**N83-23797#** Kepling and Associates, Inc., Tulsa, Okla.
**RESERVOIR HETEROGENEITY WORKSHOP**
*In its* The Impact of Geol. Parameters on Enhanced Oil Recovery May 1982 p 19-23 (For primary document see N83-23794 13-44)
Avail: NTIS HC A03/MF A01

The adequacy of data and geologic models in the public domain in characterizing geologic heterogeneities of reservoirs, a model of heterogeneities based on surface geology (outcrop) to predict reservoir properties, interpretation of data from existing tools and improved tools for determining geologic heterogeneities, performance of fluid movement in heterogenous media, minimizing effects of geologic heterogeneities on EOR, and the potential for infill drilling are summarized.
Author

**N83-23798#** Kepling and Associates, Inc., Tulsa, Okla.
**RESERVOIR DESCRIPTION WORKSHOP**
*In its* The Impact of Geol. Parameters on Enhanced Oil Recovery May 1982 p 24-29 (For primary document see N83-23794 13-44)
Avail: NTIS HC A03/MF A01

The task of identifying those areas where geologic and engineering data have not been utilized to their fullest extent in EOR applications, and to recommend research topics to remedy their deficiency was undertaken.
Author

**N83-23799#** Kepling and Associates, Inc., Tulsa, Okla.
**INSTRUMENT TECHNOLOGY**
*In its* The Impact of Geol. Parameters on Enhanced Oil Recovery May 1982 p 30-33 (For primary document see N83-23794 13-44)
Avail: NTIS HC A03/MF A01

Surface and borehole geophysics to map the process control through selective injection/withdrawal operations are discussed. The geophysical techniques most suited to these tasks are described.
Author

**N83-23800#** Kepling and Associates, Inc., Tulsa, Okla.
**GEOLOGIC INPUT INTO EOR SIMULATION TECHNIQUES WORKSHOP** **c46**
*In its* The Impact of Geol. Parameters on Enhanced Oil Recovery May 1982 p 34-40 (For primary document see N83-23794 13-44)
Avail: NTIS HC A03/MF A01

The need for geologic input into reservoir simulation studies was addressed. Among the primary objectives of the workshop group were the development of a conceptual research and development program, the provision of public input into the DOE light oil program, and the identification of areas where new techniques and/or instrumentation could aid in quantifying needed geologic input data.
Author

**N83-23801#** Department of Energy, Washington, D. C. Assistant Secretary for Conservation and Renewable Energy.
**PROCEEDINGS OF THE DOE HEAT PUMP CONTRACTORS' PROGRAM INTEGRATION MEETING**
Mar. 1982 238 p refs Meeting held in McLean, Va., 2-4 Jun. 1981
(DE82-012370; CONF-810672) Avail: NTIS HC A11/MF A01

An appropriate forum for the exchange of technical and programmatic information and for the stimulation of mutual awareness in heat pump technology programs and projects was provided. The heat pump, a device that moves heat from a region of low temperature to a region of higher temperature, is highly adaptable to a variety of energy sources and end use energy needs of interest to various research and development. For individual titles, see N83-23802 through N83-23832.

**N83-23802#** Argonne National Lab., Ill. Components Technology Div.
**OVERVIEW OF ECUT HEAT PUMP RELATED PROGRAM**
Robert E. Holtz and James G. Daley *In* DOE Proc. of the DOE Heat Pump Contractors' Program Integration Meeting Mar. 1982 p 17-19 (For primary document see N83-23801 13-44)
Avail: NTIS HC A11/MF A01

Closed cycle engines to drive heat pump compressors are discussed. These engine driven heat pumps have a large market potential in both the the residential/commercial and industrial sectors of the economy. Their use would substantially improve overall energy utilization. Engine driven heat pumps using internal combustion engines are presently in use in Europe; the energy balance on such a system is shown. It may be seen that recovery of engine reject heat is responsible for the high performance of these directly fueled systems. While engine efficiency is related to overall efficiency, very good fuel utilization is possible with engines of relatively low efficiency due to recovery of heat from exhaust gases and cooling water. The effect of engine efficiency on system performance is shown. S.L.

**N83-23803#** Brookhaven National Lab., Upton, N. Y.
**THE CHEMICAL HEAT PUMP PROGRAM. AN OVERVIEW**
Alessio Mezzina *In* DOE Proc. of the DOE Heat Pump Contractors' Program Integration Meeting Mar. 1982 p 20-22 ref (For primary document see N83-23801 13-44)
Avail: NTIS HC A11/MF A01

A brief overview of the Chemical Heat Pump Program is presented. Program background, rationale, technology description, and research and development needs are addressed. Chemical heat pumps comprise reversible reactions which can be driven by low grade heat. Thermal energy is absorbed in one direction and librated in the reverse direction: thus, serving as a basis for system designs applicable to space conditioning or process heat management and offering the capability for high density energy storage as an integral part of the system. S.L.

**N83-23804#** Gas Research Inst., Chicago, Ill.
**HIGH EFFICIENCY ADVANCED ABSORPTION HEAT PUMP**
Edward A. Reid, Jr. *In* DOE Proc. of the DOE Heat Pump Contractors' Program Integration Meeting Mar. 1982 p 33-34 (For primary document see N83-23801 13-44)
Avail: NTIS HC A11/MF A01

A high efficiency absorption heat pump for the residential market is investigated. The performance targets established for this high efficiency absorption heat pump are a heating coefficient of performance of 1.5 and a cooling coefficient of performance of 0.8 at rating conditions, including parasitic electric power consumption. The resulting heat pump would have a space heating capacity of 68,000 BTU/hour, and a space cooling capacity of 36, 000 BTU/hour at rating conditions. A very simplified schematic block diagram of the high efficiency absorption heat pump cycle is shown. High temperature, high pressure, refrigerant vapor is produced in the refrigerant generator and heat exchange system, is condensed to a liquid in the condenser, expanded to a low pressure vapor in the evaporator, and mixed with and reabsorbed into the weakened solution returned from the refrigerant generator and heat exchange system in the absorber. S.L.

**N83-23805#** Southern California Gas Co., Los Angeles.
**METAL HYDRIDE/CHEMICAL HEAT PUMP DEVELOPMENT PROJECT**
Samuel J. Cunningham *In* DOE Proc. of the DOE Heat Pump Contractors' Program Integration Meeting Mar. 1982 p 35-37 (For primary document see N83-23801 13-44)
Avail: NTIS HC A11/MF A01

The metal hydride heat pump (MMHP) is a chemical heat pump containing two hydrides for the storage and/or recovery of thermal energy. It utilizes the heat of reaction of hydrogen with specific metal alloys. The MMHP design can be tailored to provide heating and/or cooling over a wide range of input and ambient temperatures. This system can thus be used with a variety of heat sources including industrial waste heat, solar energy or even a fossil fuel. Applications and market sectors, conceptual development, thermal and mechanical design, laboratory verification of design and material performance, cost analysis and the design, fabrication and testing of an Engineering Development Test Unit (EDTU) are included within the scope of the program. S.L.

**N83-23806#** Allied Chemical Corp., Morristown, N.J.
**ORGANIC ABSORPTION GAS-FIRED RESIDENTIAL HEAT PUMP**
Kevin P. Murphy *In* DOE Proc. of the DOE Heat Pump Contractors' Program Integration Meeting Mar. 1982 p 38-40 (For primary document see N83-23801 13-44)
Avail: NTIS HC A11/MF A01

An organic absorption gas fired residential heat pump system was developed to a production prototype level. The market and business potential for the absorption heat pump market was analyzed, and the system first cost and actual annual performance and operating costs evaluated. Computer simulation of the absorption system was developed to more efficiently examine design variables and data for toxicity and product safety examined. Test units were operated to identify problems in actual service. S.L.

**N83-23807#** Battelle Columbus Labs., Ohio.
**COMPOUND ABSORPTION COOLING FROM LOW-GRADE HEAT USING ADVANCED DESORBERS**
William T. Hanna and William H. Wilkinson *In* DOE Proc. of the DOE Heat Pump Contractors' Program Integration Meeting Mar. 1982 p 43-48 (For primary document see N83-23801 13-44)
Avail: NTIS HC A11/MF A01

The commercial feasibility of an advanced absorption cooling system know as the Compound Absorption Chiller (CAC) which is motivated by low grade heat is demonstrated. Preliminary indications of technical and economic feasibility in recommended applications are shown analytical performance estimates for a demonstration unit are provided. Experimental equipment is designed and a design basis for an advanced desorber to be scaled up for use in the cooling system is established. Bench scale experiments are conducted on conventional and advanced desorber designs to determine heat transfer coefficients and other design information. A nominal 25 ton capacity chiller, motivated by low grade grad is constructed to verify the performance predictions of the analytical model. S.L.

**N83-23808#** TRW, Inc., McLean, Va. Energy Engineering Div.
**CHEMICAL HEAT PUMP COST EFFECTIVENESS EVALUATION**
Warren R. Standley *In* DOE Proc. of the DOE Heat Pump Contractors' Program Integration Meeting Mar. 1982 p 49-54 refs (For primary document see N83-23801 13-44)
Avail: NTIS HC A11/MF A01

The cost effectiveness and energy effectiveness of existing chemical heat pump (CHP) concepts are compared with a baseline of conventional energy technologies and a group of near term emerging energy technologies with which CHPs are expected to compete. The analysis is structured to evaluate these systems functioning as the primary space conditioning unit of both a 'standard' single family detached home and a 'representative' commercial building. Each HVAC system and application is analyzed in each of two locations. In addition, the CHPs are evaluated in a 'representative' industrial waste heat upgrading application, and compared to potentially competitive technologies for industrial 'heat pumping'. S.L.

**N83-23809#** Rocket Research Corp., Redmond, Wash.
**SULFURIC ACID/WATER CHEMICAL HEAT PUMP**
E. Charles Clark *In* DOE Proc. of the DOE Heat Pump Contractors' Program Integration Meeting Mar. 1982 p 55-58 refs (For primary document see N83-23801 13-44)
Avail: NTIS HC A11/MF A01

A sulfuric acid chemical heat pump chemical energy storage, CHP/CES, verification test unit (VTU) which incorporates as many commercial, mass producible design features as necessary to demonstrate system economic and technical feasibility is designed, constructed, and tested. The VTU is designed to function both as a storage HVAC unit and a temperature enhancement industrial heat pump. For purposes of gaining scaling criteria, the nominal storage design capacity shall be 10 million Btu with a nominal delivered heat rate of 150,000 Btu/hr. S.L.

**N83-23810#** Carrier Corp., Syracuse, N.Y. Energy Systems Div.
**AIR COOLED ABSORPTION CHILLERS FOR SOLAR COOLING APPLICATIONS**
Wendell J. Biermann and Robert C. Reimann *In* DOE Proc. of the DOE Het Pump Contractors' Program Integration Meeting Mar. 1982 p 59-61 (For primary document see N83-23801 13-44)
(Contract EG-77-C-03-1587)
Avail: NTIS HC A11/MF A01

The chemical composition of a 'best' absorption refrigerant system is identified, and those properties of the system necessary to design hot water operated, air cooled chilling equipment are determined. Air cooled chillers from single family residential sizes into the commercial rooftop size range are designed and operated. S.L.

**N83-23811#** Carrier Corp., Syracuse, N.Y. Energy Systems Div.
**WATER COOLED ABSORPTION CHILLERS FOR SOLAR COOLING APPLICATIONS**
Wendell J. Biermann and Robert C. Reimann *In* DOE Proc. of the DOE Heat Pump Contractors' Program Integration Meeting Mar. 1982 p 62-64 (For primary document see N83-23801 13-44)
Avail: NTIS HC A11/MF A01

A broad line of absorption chillers designed to operate with hot fluids at as low a temperature as practical while rejecting heat to a stream of water was developed. A packaging concept for solar application in which controls, pumps, valves and other system components could be factor assembled into a unitary solar module was investigated. S.L.

**N83-23812#** Texas Univ., Austin. Center for Energy Studies.
**MULTIPLE-EFFECT ABSORPTION CYCLE SOLAR COOLING**
Gary C. Vliet *In* DOE Proc. of the DOE Heat Pump Contractors' Program Integration Meeting Mar. 1982 p 65-68 refs (For primary document see N83-23801 13-44)
(Contract DE-AC03-79SF-10540)
Avail: NTIS HC A11/MF A01

A dynamic computer model of the water lithium bromide double effect absorption cooling cycle was developed. The code was used to assess the effect on performance of variations in the cycle's several design and operating parameters. The cost of double effect absorption cooling per unit of capacity for varying capacity was assessed. S.L.

**N83-23813#** EIC, Inc., Newton, Mass.
**SOLAR HEATING AND COOLING WITH THE CaCl2-CH3OH CHEMICAL HEAT PUMP**
Peter OD. Offenhartz *In* DOE Proc. of the DOE Heat Pump Contractors' Program Integration Meeting Mar. 1982 p 75-77 refs (For primary document see N83-23801 13-44)
Avail: NTIS HC A11/MF A01

A chemical heat pump based on the reaction of calcium chloride and methanol is being designed and optimized for solar heating and air conditioning, primarily for the residential and light commercial market. The performance requirements for this application are quite stringent. For example, to minimize maintenance, a cooling tower should not be used, and the solar collectors should be fixed rooftop flat plates or evacuated tubes. The chiller should be capable of reaching 45 F on a 95 F day in order to provide effective dehumidification. Energy storage for late afternoon and early evening cooling, as well as night time winter heating, must be provided. S.L.

**N83-23814#** Westinghouse Electric Corp., Pittsburgh, Pa.
**DEVELOPMENT AND DEMONSTRATION OF AN ELECTRIC HEAT PUMP FOR WASTE HEAT RECOVERY IN INDUSTRY**
William C. Moreland *In* DOE Proc. of the DOE Heat Pump Contractors' Program Integration Meeting Mar. 1982 p 85-88 refs (For primary document see N83-23801 13-44)
(Contract DE-AC01-77CS-40327)
Avail: NTIS HC A11/MF A01

The technical feasibility and economic viability of using heating pumps to reclaim low temperature waste heat energy from industrial processes was demonstrated. Delivery temperatures of 250 to 350 F, source temperatures of 180 to 250 F, coefficients of performance of 3 or greater, and paybacks of four years or less are expected. S.L.

**N83-23815#** Mechanical Technology, Inc., Latham, N. Y.
**THE DESIGN OF AN OPEN RANKINE-CYCLE INDUSTRIAL HEAT PUMP**
David W. Chaudoir and H. M. Leibowitz *In* DOE Proc. of the DOE Heat Pump Contractors' Program Integration Meeting Mar. 1982 p 89-95 refs (For primary document see N83-23801 13-44)
Avail: NTIS HC A11/MF A01

An open Rankine cycle heat pump is ideally suited for producing low pressure industrial process steam. Because steam serves as both the heat pump motive fluid and process fluid, the system achieves a unique simplicity and versatility. No intermediate refrigerant fluid exists for which to construct a process interface or impose a temperature limit. Interface components such as the heat pump condenser are not required. Moreover, the use of water vapor eliminates toxicity and flammability risks inherent with most closed cycle heat pump fluids. The control strategy is simple. Low pressure (subatmospheric) water vapor, generated by flashing steam at a temperature below that of the waste stream, is compressed to the process pressure and temperature by an electric motor driven, multistage compressor train. S.L.

**N83-23816#** General Electric Co., Schenectady, N. Y. Corporate Research and Development Dept.
**OPEN CYCLE HEAT PUMP FOR INDUSTRIAL WASTE HEAT UTILIZATION**
Clarence R. Snyder *In* DOE Proc. of the DOE Heat Pump Contractors' Program Integration Meeting Mar. 1982 p 96-97 (For primary document see N83-23801 13-44)
Avail: NTIS HC A11/MF A01

The open cycle industrial process heat pump technology is a cost-effective method of utilizing an industrial plant's waste heat. Three sites and four process configurations were evaluated. The basis for the initial screening provided opportunities to exploit the features of the open cycle arrangement. Site visits yielded process information on flow rates, process temperatures, pressures, dynamic behavior, energy balances, control functions and plant operating philosophy. Additional information was obtained relating to plant utilities and equipment location. Comparative evaluations were made considering energy savings, cost savings, value of operating experience and the potential for wide application. S.L.

**N83-23817#** United Technologies Research Center, East Hartford, Conn.
**CONCEPTUAL DESIGN OF LARGE SCALE HEAT PUMP FOR CENTRAL ENERGY MANAGEMENT SYSTEM**
R. W. Bass, A. M. Landerman, and Frank R. Biancardi *In* DOE Proc. of the DOE Heat Pump Contractors' Program Integration Meeting Mar. 1982 p 97-100 (For primary document see N83-23801 13-44)
(Contract DE-AC09-77ET-12866)
Avail: NTIS HC A11/MF A01

An analytical study was undertaken to identify specific power generation and heat pump requirements for low-temperature waste heat recovery from government, utility and industrial sources, develop techniques needed to evaluate the performance and cost characteristics of various power system and heat pump options, and perform economic analyses on selected designs. Distinct waste heat sources and industrial end-uses were selected as representative applications and used for heat pump design specifications. Two of these applications typify large sources of waste heat and collocated industrial park end-uses while the remaining four represent in-plant industrial sources and end-uses. Rankine-cycle heat pump configurations and working fluid options were assessed and four configurations were selected on the basis of cost and performance for further study. Five different prime movers were examined as potential compressor drivers and gas turbines and diesels were selected on basis of high overall performance. A similar design assessment was performed for power recovery systems. A conceptual design of an economically

attractive central energy management system for use at an industrial park located near by the Portsmouth gaseous diffusion plant is presented. Author

**N83-23818#** AiResearch Mfg. Co., Torrance, Calif.
**BRAYTON-CYCLE HEAT PUMP FOR SOLVENT RECOVERY**
Gilbert E. Limberg *In* DOE Proc. of the DOE Heat Pump Contractors' Program Integration Meeting Mar. 1982 p 101-104 (For primary document see N83-23801 13-44)
(Contract DE-AC03-78CS-40005)
Avail: NTIS HC A11/MF A01

The solvent-using industries are lagging in recognizing the impact of the recently accelerated fuel price increases, and studies show that solvent recovery is an excellent means of reducing these costs. The Federal Clean Air Act requiring that more stringent clean air emission levels be implemented by December 31, 1982, is another incentive for these industries to enhance solvent recovery. The versatility of the Brayton cycle allows it ot be integrated into a variety of processes, and considerable energy and cost savings can accrue over those obtainable with the normally used carbon-steam desorption solvent recovery systems. The annual energy savings to be realized by installing an 8000-cfm Brayton-cycle system at the demonstration site is approximaately 56 x 10 to the 9th power Btu/yr and simple cost pay backs of less than 1 yr are achievable. The estimated market potential for the Brayton cycle in 1980 in the U.S. is the removal of 6.3 million ions of volatile solvents (56 percent of the estimated recoverable solvents). The potential net energy savings is 0.11 quads better than for a carbon-steam desorption system. Author

**N83-23819#** Energy Utilization Systems, Inc., Pittsburgh, Pa.
**DEMONSTRATION OF A HEAT PUMP WATER HEATER**
Robert P. Blevins *In* DOE Proc. of the DOE Heat Pump Contractors' Program Integration Meeting Mar. 1982 p 105-107 ref (For primary document see N83-23801 13-44)
Avail: NTIS HC A11/MF A01

In the period between March 1979 and January 1980, 85 prototype heat pump water heaters were installed in single-family residences. Each system was monitored for a period of one year and total program monitoring was concluded at the end of December 1980. The field demonstration provided a total of 643 unit-months of usable operational data which showed an average OOP of 1.93, or an average 48% operating savings compared to resistance water heating. Average operating conditions were 73 gallons of 140 F water consumed each day with an average inlet water temperature of 71 F. Despite a high initial failure rate for the prototypes, which resulted in a protracted debugging period, consumer reaction to the system was extremely positive. The data suggests that the HPWH would save the average consumer in the test program 2917 kWh per year. Measurable impacts on heating/cooling systems were detected in only 8% of the test homes. Author

**N83-23820#** Lincoln Lab., Mass. Inst. of Tech., Lexington.
**SOLAR HYBRID ENERGY PROGRAM**
Edward Kern *In* DOE Proc. of the DOE Heat Pump Contractors' Program Integration Meeting Mar. 1982 p 108-110 refs (For primary document see N83-23801 13-44)
(Contract DE-AS01-77CS-34577)
Avail: NTIS HC A11/MF A01

During the design phase of the project a preferred residential heat pump and collector configuration was identified for both northern and southern climate locations. The preferred collectors [PV or PV/T] were identified for each location. Experimental data were used to quantify a temperature 'defect' which may exist in previous simulations involving air-source heat pumps. Laboratory data were obtained which show that the steady-state operations of an air-source heat pump and a utility-interactive PV power system are compatible. Substantial data from a residential prototype system were obtained. These data establish the reliability and effectiveness of the combined heat pump and PV power system. It was demonstrated that the secondary heat pump functions of 'boosting' and domestic hot water heating are difficult to perform effectively at low compressor speed. Author

**N83-23821#** General Electric Co., Philadelphia, Pa.
**DEVELOPMENT AND DEMONSTRATION OF A STIRLING/RANKINE HEAT ACTIVATED HEAT PUMP**
Richard C. Meier *In* DOE Proc. of the DOE Heat Pump Contractors' Program Integration Meeting Mar. 1982 p 118-123 (For primary document see N83-23801 13-44)
(Contract DE-AC02-77CS-20043)
Avail: NTIS HC A11/MF A01

The current Phase II program includes the development of an engineering prototype heat activated heat pump, followed by the development and field testing of the engineering prototype was completed in early 1979. All of the components and subsystems met their performance goals except for the Stirling engine. The engine achieved an efficiency of 26%, versus a goal of 30%. Empirical data from the engineering prototype was then used to design the residential unit prototype, using a third order simulation model developed for the engine/compressor. Development and testing of the system components and the combustor/engine/compressor subsystem have been completed, preparations for laboratory tests of the complete residential unit prototype system are underway, and installation preparations at the field test site are nearly completed. The prototype residential unit components met their goals, except again for the Stirling engine. The engine achieved indicated power and efficiency values of 2.8Kw and 27%, versus goals of 3.2Kw and 33%, respectively. Author

**N83-23822#** Sunpower, Inc., Athens, Ohio.
**DUPLEX STIRLING GAS FIRED HEATING ONLY HEAT PUMP**
William Beale *In* DOE Proc. of the DOE Heat Pump Contractors' Program Integration Meeting Mar. 1982 p 127-129 refs (For primary document see N83-23801 13-44)
Avail: NTIS HC A11/MF A01

In phase I the Duplex Stirling Gas fired Heat Pump was analyzed with the aid of the Sunpower third order simulation and optimization code and found to show heating COP of 1.7 at the rating point of 8 C (17 F) with a heat delivery of 10 kW. Also it was found that a direct heat exchange between working fluid and source and sink air was consistent with high COP in the heat pump, thus eliminating the need for an intermediate heat transfer fluid and its associated pumps and controls. Further, it was demonstrated in the simulation that the heat engine power output could be matched to the heat pump load over the range of source temperatures without need of complex control systems. Cost estimates, along with COP figures from the analysis indicated a payback time of 2 to 4 years in completion with existing combustion heating systems in northern climates. Author

**N83-23823#** Mechanical Technology, Inc., Latham, N. Y.
**FREE-PISTON SIRLING ENGINE TECHNOLOGY DEVELOPMENT**
George R. Dochat *In* DOE Proc. of the DOE Heat Pump Contractors' Program Integration Meeting Mar. 1982 p 130-133 refs (For primary document see N83-23801 13-44)
Avail: NTIS HC A11/MF A01

The program will utilize the Technology Demonstrator Engine system as a test bed to evaluate specific loss mechanisms within the engine during operation. This will provide meaningful information and test data to increase understanding of free-piston operation, and will be of benefit to application development programs for heat-activated heat pumps, fluid pumps, engine generators, etc. The evaluation will include the current analytical procedures for calculating the specific losses, perform a series of tests designed to isolate each loss, comparison of actual changes in engine performance with predicted change, and in engine performance with predicted change, and to determine the adequacy of present analytical methods. Recommendations to improve overall engine/system performance and/or analytical methods will be made.
L.F.M.

**N83-23824#** General Electric Co., Philadelphia, Pa.
**KINEMATIC STIRLING ENGINE POWER SYSTEM DEVELOPMENT AND DEMONSTRATION**
James A. Bledsoe *In* DOE Proc. of the DOE Heat Pump Contractors' Program Integration Meeting Mar. 1982 p 134-138 refs (For primary document see N83-23801 13-44)
(Contract DE-AC01-76ET-32002)
Avail: NTIS HC A11/MF A01

Although the original program was redirected to a technology demonstration program in 1978, the emphasis on the engine development and fabrication continued as planned. All major components of the system completed the design and documentation phase. Major components and subsystems required for engine test all met their performance goals. The engine achieved an efficiency of 28.6% with 3800 watts heat delivered to the engine as compared with the 30% predicted value at the design point conditions. Total engine operating time was over 500 hours and post test inspections revealed no major problems with the hardware. One minor problem was associated with the lubrication system which is easily corrected. Author

**N83-23825#** United Technologies Corp., East Hartford, Conn.
**DEVELOPMENT OF A SOLAR-POWERED RANKINE CYCLE HEAT PUMP**
Frank R. Biancardi, Gorken Melikian, and J. W. Sitler *In* DOE Proc. of the DOE Heat Pump Contractors' Program Integration Meeting Mar. 1982 p 147-151 (For primary document see N83-23801 13-44)
(Contract DE-AC03-77CS-34510)
Avail: NTIS HC A11/MF A01

The first prototype 18-ton solar-powered turbocompressor heat pump module was successfully designed, built and tested for more than 250 hr. in a specially-designed laboratory facility at UTRC. Operation in both the cooling and heat pump mode was demonstrated over a wide range of building, climatic, and collector/storage conditions. The design point performance of the heat pump in both the cooling and heat pump modes was confirmed, and performance mapping of the module completed. The heat pump demonstrated the wide operating range possible (using 200 to 300 F hot water) and high heat pump mode performance levels, such as a COP of 1.4 to 2.5 and 500,000 Btu/hr capacity. In cooling, a COP of 0.5 to 0.75 and up to 20 tons was demonstrated. In a simulation of operation in an actual building, the heat pump smoothly and accurately followed the building load for a full day. A detailed assessment of the individual module components was completed and performance, cost and reliability improvements were identified. No evidence of R11 decomposition or component wear or corrosion was found. Author

**N83-23826#** Battelle Columbus Labs., Ohio.
**CONDUCT A STATE-OF-THE-ART SURVEY OF EXISTING KNOWLEDGE FOR THE DESIGN OF GROUND-SOURCE HEAT PUMPS**
David A. Ball *In* DOE Proc. of the DOE Heat Pump Conductors' Program Integration Meeting Mar. 1982 p 155-160 refs (For primary document see N83-23801 13-44)
Avail: NTIS HC A11/MF A01

Horizontal serpentine coils have been and are at present the most common coil configuration. Best design data exist for horizontal coils in heating only applications with moist soil. Applications in dry soil or where significant summer cooling is required are not as well understood at this time. A seasonal performance factor of about 3.0 can be expected for a properly designed and installed residential ground-coupled heat-pump system. Long-term durability of buried steel and cooper tubing has been demonstrated. Life expectancy of thin-walled polyethylene tubing in the heating-only application is expected to be equally as good: however, present experience is limited to less than five years. In the cooling application with heat-rejection temperatures exceeding 100 F, some cracking has been experienced upon subsequent cool-down for heating operation due to localized stresses induced by conformity of the tubing to bedding material (stones) when hot. Receding of the soil from the pipe after a period of several years was experienced in the late 1940's. An understanding of this phenomenon may be crucial to the long-term operating success of these systems. L.F.M.

**N83-23827#** Oklahoma State Univ., Stillwater.
**PERFORMANCE MONITORING OF A GROUND-COUPLED SOLAR ASSISTED HEAT PUMP SYSTEM**
Jerald D. Parker *In* DOE Proc. of the DOE Heat Pump Contractors' Program Integration Meeting Mar. 1982 p 166-169 refs Prepared in cooperation with Oklahoma Gas and Electric Co. (For primary document see N83-23801 13-44)
Avail: NTIS HC A11/MF A01

Approximately five months of good data have been collected and studied. These data are for November 1980 through April 1981. Some of these data have been processed and analyzed. They show reductions in both energy consumption and in peak demand for the ground and solar assisted ground systems. A simulation program has been written to help analyze the data in a more meaningful way. This program simulates the building, the heat pump system, the ground source exchanger and when needed, the solar loop. Author

**N83-23828#** Argonne National Lab., Ill.
**THE DOE HEAT-PUMP-CENTERED INTEGRATED COMMUNITY ENERGY SYSTEMS PROJECT**
James M. Calm *In* DOE Proc. of the DOE Heat Pump Contractors' Program Integration Meeting Mar. 1982 p 185-192 refs (For primary document see N83-23801 13-44)
(Contract W-31-109-eng-38)
Avail: NTIS HC A11/MF A01

The Heat-Pump-Centered Integrated Community Energy Systems Project seeks to conserve energy by developing heat pump systems for district heating and cooling. Seven contractor teams were involved in concept development and subsequent application feasibility studies. A technical and economic assessment of the systems developed was performed based on the results of these and two related studies. The assessment concludes that district heating and cooling with heat pumps can conserve energy resources, and particularly nonrenewable fuels, in an environmentally and economically attractive way. The application potential is believed to be broad, and the energy savings of widespread implementation would be substantial. No one system is universally applicable, but many options exists. Market forces are already promoting many of the required technologies, but further research, development, and demonstration could accelerate implementation. Author

**N83-23829#** Research Triangle Inst., Research Triangle Park, N.C.
**STEADY-STATE PERFORMANCE CHARACTERISTICS OF LATENT HEAT TES/HEAT PUMP SYSTEMS**
Tony W. Sigmon *In* DOE Proc. of the DOE Heat Pump Contractors' Program Integration Meeting Mar. 1982 p 194-197 refs (For primary document see N83-23801 13-44)
(Contract DE-AC01-79ET-26707)
Avail: NTIS HC A11/MF A01

Two projects are currently being completed that wholly or in part address various technical issues involved in the implementation of heat pump systems combined with thermal energy storage (TES). The first of these involves the determination of steady state performance characteristics for six generic TES/heat pump configurations and the comparison of the operational performance of these systems with other space heating and cooling TES technologies. Of these latter systems four are commercial or near commerical air conditioner or heat pump coupled TES systems. Steady state performance has been established for all systems. Operational performance and system life cycle cost has been determined for the six generic designs for a limited set of application conditions. The intent of the second project is to establish a reliable method of estimating seasonal energy use by TES/heat pump systems, to utilize this methodology to evaluate a large number of possible system designs, identify a small number of systems that

merit more detailed analysis, and, to the extent possible, conduct these detailed studies. Author

**N83-23830#** Foster-Miller Associates, Inc., Waltham, Mass.
**LOW TEMPERATURE WASTE HEAT UTILIZATION CHILLER SYSTEM**
Scott Hynek *In* DOE Proc. of the DOE Heat Pump Contractors' Program Integration Meeting Mar. 1982 p 201-205 (For primary document see N83-23801 13-44)
Avail: NTIS HC A11/MF A01

The preliminary system design is complete; standard components (including condenser and compressor) have been selected and special components (such as rotary expander valve and boiler feed pump) have been designed. The boiler feed pump has been tested, and expander testing is underway. The design and construction of a complete demonstration system has begun. Author

**N83-23831#** Dunham-Bush, Inc., West Hartford, Conn.
**MULTIPLE SLIDE SCREW COMPRESSION**
David N. Shaw *In* DOE Proc. of the DOE Heat Pump Contractors' Program Integration Meeting Mar. 1982 p 214-216 (For primary document see N83-23801 13-44)
(Contract DE-AC03-79CS-30035)
Avail: NTIS HC A11/MF A01

The objective of this project is to develop the best possible compressor for use in Series Solar Heat Pump Systems. The compressor must be able to operate at extremely high efficiency levels from a compression ratio as low as 1.5 up to compression ratio as high as 6.5. The compressor must have the capability to efficiently adjust to the widely varying inlet flow requirements as dictated by the operating conditions of the Series Solar Heat Pump System. Prototype design has been completed yet some simplification redesign is now taking place. L.F.M.

**N83-23832#** Carrier Corp., Syracuse, N.Y. Energy Systems Div.
**DEVELOPMENT OF A HIGH TEMPERATURE SOLAR POWERED WATER CHILLER**
Richard A. English *In* DOE Proc. of the DOE Heat Pump Contractors' Program Integration Meeting Mar. 1982 p 217-218 (For primary document see N83-23801 13-44)
(Contract DE-AC03-77CS-31590)
Avail: NTIS HC A11/MF A01

The objectives of this program are: to develop a high temperature solar powered air cooled 25 ton chiller utilizing 250 to 300 F solar hot water suitable for commercial and multi-family applications; to study, design, and build a prototype Rankine powered vapor compression cycle; and to demonstrate and evaluate performance through steady state and dynamic laboratory testing. Cycle studies and preliminary turbo machine studies were completed under Phase I establishing the final conceptual approach and anticipated cost/performance The evaluation of the working fluid thermal stability has satisfactorily shown that R-113 has excellent life potential in an oil-free steel boiler at the maximum expected temperature, 320 F, for this application. The detailed design of the turbo machine and the chiller has been completed. The turbomachine has been completed and has successfully passed its qualification tests on air. The chiller has been built in the water cooled configuration, has been installed in a test facility, instrumented and charged. A two stage boiler feed pump has been developed and successfully tested on R-113 in a separate loop. L.F.M.

**N83-23833#** Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
**BIOTECHNOLOGY FOR THE PRODUCTION OF CHEMICALS AND FUELS FROM BIOMASS**
Ruxton H. Villet, ed. Dec. 1982 198 p refs Workshop held in Vail, Colo., 29 Sep. - 2 Oct. 1980 Sponsored by DOE
(DE83-005500; SERI/CP-232-1520) Avail: NTIS HC A09/MF A01

The integration of scientific and process engineering which is required in the development of biotechnology was examined. Topics discussed are: fermentation of conventional feedstocks; conversion lignocellulose; algal biotechnology; and biotechnological process engineering and evaluation. For individual titles, see N83-23834 through N83-23849.

**N83-23834#** Eidgenoessische Technische Hochschule, Zurich (Switzerland).
**METABOLIC REGULATION OF YEAST**
Armin Fiechter *In* Midwest Research Inst. Biotechnol. for the Production of Chem. and Fuels from Biomass Dec. 1982 p 3-16 refs (For primary document see N83-23833 13-44)
Avail: NTIS HC A09/MF A01

Metabolic regulation which is based on endogeneous and exogeneous process variables which may act constantly or time dependently on the living cell is discussed. The observed phenomena of the regulation are the result of physical, chemical, and biological parameters. These parameters are identified. Ethanol is accumulated as an intermediate product and the synthesis of biomass is reduced. This regulatory effect of glucose is used for the aerobic production of ethanol. Very high production rates are thereby obtained. Understanding of the regulation mechanism of the glucose effect has improved. In addition to catabolite repression, several other mechanisms of enzyme regulation have been described, that are mostly governed by exogeneous factors. Glucose also affects the control of respiration in a third class of yeasts which are unable to make use of ethanol as a substrate for growth. This is due to the lack of any anaplerotic activity. As a consequence, diauxic growth behavior is reduced to a one-stage growth with a drastically reduced cell yield. The pulse chemostat technique, a systematic approach for medium design is developed and medium supplements that are essential for metabolic control are identified. E.A.K.

**N83-23835#** National Research Council of Canada, Ottawa (Ontario).
**THE PROSPECTS FOR THE APPLIED GENETIC ENGINEERING OF YEAST** **c51**
Harry vanKeulen and David Y. Thomas *In* Midwest Research Inst. Biotechnol. for the Production of Chem. and Fuels from Biomass Dec. 1982 p 17-30 refs (For primary document see N83-23833 13-44)
Avail: NTIS HC A09/MF A01

The possibilities for genetically engineering into the yeast Saccharomyces cerevisiae new genes for the utilization of carbohydrates were examined. The present status of cloning vectors for yeast and their properties are reviewed. The development of methods for cloning new genes into yeast are described. The desirable features for the development of genetically modified yeasts for industry are discussed. E.A.K.

**N83-23836#** Seville Univ. (Spain). Dept. de Genetica.
**CHARACTERIZATION OF SACCHAROMYCES STRAINS WITH RESPECT TO THEIR ABILITY TO GROW AND FERMENT IN THE PRESENCE OF ETHANOL AND SUCROSE**
Tahia Benitez, Lucas delCastillo, Andres Aguilera, Jaime Conde, and E. Cerda-Olmedo *In* Midwest Research Inst. Biotechnol. for the Production of Chem. and Fuels from Biomass Dec. 1982 p 31-48 refs (For primary document see N83-23833 13-44)
Avail: NTIS HC A09/MF A01

To optimize the conversion of carbohydrates to ethanol strains of several Saccharomyces species were examined for their ability to grow and ferment in a range of sucrose and ethanol concentrations. Isolated wine yeasts grew in the presence of 10% ethanol to the same final cell density as control cultures without ethanol. The best of these yeast strains grew in the presence of 15% ethanol and fermented in 18%. Ethanol accumulated, although at a reduced rate, after the cells stopped growing. Most yeast strains were highly fermentative in 50% sucrose. Some of them effectively utilized the carbohydrates of the culture, yielding final ethanol concentrations over 14%. Sixteen of the 35 strains were chosen for genetic analysis and breeding because of their capacity to sporulate. These strains are homothallic and their spores are viable. E.A.K.

**N83-23837#** California Univ., Davis. Lab. for Plant Growth.
**GENETIC ENGINEERING FOR FUELS AND CHEMICALS: A PROLINE-OVERPRODUCING PLASMID WHICH CONFERS OSMOTIC TOLERANCE TO FERMENTATIONS**
L. Csonka, Su-sheng Yang, and R. C. Valentine *In* Midwest Research Inst. Biotechnol. for the Production of Chem. and Fuels from Biomass Dec. 1982 p 49-56 refs (For primary document see N83-23833 13-44)
Avail: NTIS HC A09/MF A01

The molecular basis of osmoregulation in molecular biology was studied. It is an area for potential applications for enhancing production of fuels and chemicals by fermentations. E.A.K.

**N83-23838#** Charles F. Kettering Research Lab., Yellow Springs, Ohio.
**THE USE OF ANHYDROUS HF SOLVOLYSIS IN CONVERSION OF BIOMASS TO GLUCOSE**
Andrew Mort and Susan Parker *In* Midwest Research Inst. Biotechnol. for the Production of Chem. and Fuels from Biomass Dec. 1982 p 57-64 refs (For primary document see N83-23833 13-44)
Avail: NTIS HC A09/MF A01

Anhydrous hydrogen fluoride solubilizes and deploymerizes crystalline cellulose, cellulose imbedded in lignin, and amorphous polysaccharides in less than 15 minutes at temperatures as low as 0 C. It is suggested that this reaction may be used to convert crude cellulosic biomass materials into sugar monomers suitable for microbial fermentation. No degradation of the sugars during the HF-catalyzed deploymerization is noted. Because the HF is very volatile it is easily removed from the reaction for reuse with more biomass. The characterization of this reaction and the many advantages of HF solvolysis over acid and enzymatic hydrolysis are examined. Some of the special problems associated with HF are discussed. E.A.K.

**N83-23839#** Massachusetts Inst. of Tech., Cambridge. Dept. of Nutrition and Food Science.
**CLOSTIDIUM THERMOCELLUM AS AN ETHANOL PRODUCER: ITS CHARACTERISTICS AND CURRENT AND FUTURE RESEARCH**
Reinaldo F. Gomez *In* Midwest Research Inst. Biotechnol. for the Production of Chem. and Fuels from Biomass Dec. 1982 p 65-70 (For primary document see N83-23833 13-44)
(Contract EG-77-S-02-4198)
Avail: NTIS HC A09/MF A01

Ethyl alcohol which can be mixed with gasoline to obtain gasohol, a motor fuel that is as good as or better than gasoline is discussed. Ethanol can be made from ethylene derived from hydrocarbons or by fermentation of sugars derived from plant matter. Sugars derived from two classes of plant matter, starch and cellulose, can be fermented and distilled into ethanol. The conversion of cellulose to fermentable sugars and the fermentation of these sugars to ethanol in a single step which reduces capital costs is discussed. E.A.K.

**N83-23840#** Midwest Research Inst., Golden, Colo. Biotechnology Branch.
**THERMOPHILIC DEGRADATION OF CELLULOSIC BIOMASS**
Thomas Ng and J. G. Zeikus (Wisconsin Univ.) *In its* Biotechnol. for the Production of Chem. and Fuels from Biomass Dec. 1982 p 71-82 refs (For primary document see N83-23833 13-44)
Avail: NTIS HC A09/MF A01

The conversion of cellulosic biomass to chemical feedstocks and fuel by microbial fermentation is an important objective of developing biotechnology. Direct fermentation of cellulosic derivatives to ethanol by thermophilic bacteria offers a promising approach to this goal. Fermentations at elevated temperatures lowers the energy demand for cooling and also facilitates the recovery of volatile products. In addition, thermophilic microorganisms possess enzymes with greater stability than those from mesophilic microorganisms. Three anaerobic thermophilic cocultures that ferment cellulosic substrate mainly to ethanol have been described: Clostridium thermocellum/Clostriidium thermohydrosulfuricum, C. thermocellum/Clostridium thermosaccharolyticum, and C. thermocellum/Thermoanaerobacter ethanolicus sp. nov. The growth characteristics and metabolic features of these cocultures are reviewed. Author

**N83-23841#** Florida Univ., Gainesville. Dept. of Food Science and Human Nutrition.
**BIOSYNTHESIS OF THE ENZYMES OF THE CELLULASE SYSTEM BY T. REESEI QM 9414 IN THE PRESENCE OF SOPHOROSE**
Mikelina Gritzali *In* Midwest Research Inst. Biotechnol. for the Production of Chem. and Fuels from Biomass Dec. 1982 p 83-90 refs (For primary document see N83-23833 13-44)
Avail: NTIS HC A09/MF A01

As conventional, nonrenewable energy sources are rapidly depleted and it was necessary to search for alternative sources of energy. It was increasingly apparent that biomass and waste are alternatives well worth exploring. The sources of biomass and wastes that considered for conversion to useful products are quite diverse, but the most abundant constituent of almost every type is cellulose. Cellulose is cleanly converted to soluble fermentable sugars enzymatically, and cellulose enzymes were isolated from a number of microbial sources. It is generally agreed that the most effective system of enzymes for the conversion of cellulose to glucose is produced by species of the imperfect fungus Trichoderma. The mutant organism Trichoderma reesei QM 9414 is among the best producers of high levels of enzymes; these are extracellular and have carbonhydrate covalently bound to the peptide. Trichoderma produces three types of enzymes which, in a sequential and cooperative manner, convert cellulose to soluble oligosaccharides and glucose. Author

**N83-23842#** Saint Louis Univ., Mo. Dept. of Microbiology.
**CONTROL OF DEVELOPMENT AND SECONDARY METABOLITE PRODUCTION IN STREPTOMYCETES AND ITS POSSIBLE IMPORTANCE IN LIGNOCELLULOSE UTILIZATION**
Burton M. Pogell *In* Midwest Research Inst. Biotechnol. for the Production of Chem. and Fuels from Biomass Dec. 1982 p 91-104 Sponsored in part by NSF, NIH and Merck and Co. (For primary document see N83-23833 13-44)
Avail: NTIS HC A09/MF A01

Large scale fermentations for production of antibiotics and other secondary metabolites have focused on two groups of microorganisms: the streptomycetes, which are highly developed procaryotes, and fungi, eucaryotic organisms which go through a similar developmental cycle. Interestingly, these organisms provided the most active known degraders of lignocellulose. Examples include Streptomyces badius and the white rot fungi Phanerochaete chrysosporium. Since cellulose is ubiquitously found in nature linked with lignin, microorganisms that can simultaneously degrade both of these bipolymers are ideal for utilization of biomass for production of fuels, chemicals, and foodstuffs. The role of extrachromosomal DNA (plasmids) and specific endogenous effectors in the regulation of development and other secondary metabolite production in streptomycetes is of great interest. Approaches for engineering improved strains for biomass utilization are presented. Author

**N83-23843#** Scripps Institution of Oceanography, La Jolla, Calif.
**TASKS FOR THE MICROBIAL GENETICIST IN PHYCOTECHNOLOGY**
Ralph A. Lewin *In* Midwest Research Inst. Biotechnol. for the Production of Chem. and Fuels from Biomass Dec. 1982 p 105-112 (For primary document see N83-23833 13-44)
Avail: NTIS HC A09/MF A01

Applied algal genetics, though in its infancy, should prove increasingly valuable in augmenting some of the crops used for biomass production in the future. By selecting suitable strains from nature, inducing changes by mutagenesis, and genetically recombining desirable features, algal strains are obtained which in predetermined conditions of culture are more easily or cheaply harvested or are superior to ordinary wild types in growth rate, final yield, or biochemical composition. The potential of such algal cultivars for biomass production needs to be exploited. Author

**N83-23844#** Commissariat a l'Energie Atomique, Cadarache (France). Dept. de Biologie.

**HELIOSYNTHESIS: A SOLAR BIOTECHNOLOGY BASED ON DIRECT BIOCONVERSION OF SOLAR ENERGY BY PHOTOSYNTHETIC CELLS**

Claude Gudin *In* Midwest Research Inst. Biotechnol. for the Production of Chem. and Fuels from Biomass Dec. 1982 p 113-120 refs (For primary document see N83-23833 13-44)
Avail: NTIS HC A09/MF A01

Certain limiting aspects of current technology should be studied, such as the lifetimes of tubing material and the utilization of renewable sources of energy for pumping. Only exocellular or cellular biomass with high specific value, involving small markets and small plant areas (less than 1 ha), will be economically possible for the short term and will allow improvement of this technology. A valorization of the totality of photosynthetic biomass with respect to economics and energy is an absolute necessity. There is an immediate need for genetic studies of microalgae that will allow enhancement or even creation of chemical production satisfying economic and energy needs. Such efforts should permit the rapid establishment of an aggressive and sophisticated solar biotechnology that integrates scientific and technical' developments to meet the new needs of humanity for food, chemicals, and energy, thereby complementing agriculture with a sort of cellular horticulture.
Author

**N83-23845#** National Research Council of Canada, Halifax (Nova Scotia). Research Lab.

**PRODUCTION OF MARINE PLANT BIOMASS: MANAGEMENT, CULTIVATION, AND GENETIC MODIFICATION OF MACROPHYTIC ALGAE**

John P. vanderMeer *In* Midwest Research Inst. Biotechnol. for the Production of Chem. and Fuels from Biomass Dec. 1982 p 121-132 refs (For primary document see N83-23833 13-44)
Avail: NTIS HC A09/MF A01

Every second of every day, the Sun's fusion reactions convert thousands of tons of hydrogen into helium with the release of almost unimaginable amounts of energy. Through the photosynthetic activity of plants, both aquatic and terrestrial, a small fraction of this energy is trapped and stored as plant biomass. The oceans cover a greater fraction of the globe than do the land masses, making it appropriate to consider their contribution to the total biomass production, and their potential as a source of raw materials for the extraction of chemicals and fuels. A rather broad synthesis, convering the total seaweed resource and some of the constraints placed on harvesting these plants, attempts to farm the oceans to increase the supply of desirable species, attempts to cultivate seaweeds in enclosures where environmental parameters are controlled, and finally, the limited amount of genetic manipulation that was applied to these plants was presented. Only the larger red and brown seaweeds were considered because they represent the bulk of the biomass.
Author

**N83-23846#** Kernforschungsanlage, Juelich (West Germany). Inst. fuer Biotechnologie.

**MEMBRANE REACTORS FOR CONTINUOUS COENZYME REGENERATION**

Christian Wandrey and R. Wichmann *In* Midwest Research Inst. Biotechnol. for the Production of Chem. and Fuels from Biomass Dec. 1982 p 133-145 refs (For primary document see N83-23833 13-44)
Avail: NTIS HC A09/MF A01

The importance of continuous coenzyme regeneration is discussed with respect to chemical reaction engineering. The benefit of coenzymes covalently bound to water soluble polymers is especially stressed. The performance of membrane reactors for coenzyme regeneration is discussed in comparison with other reactor concepts. The coenzyme dependent production of L-amino acids from the corresponding alpha-keto acids is used to illustrate how precise turnover numbers as a function of enzyme/coenzyme ratio, initial substrate concentration, and conversion are obtained. Thus, it becomes possible to develop a concept for optimal operating points with respect to enzyme, coenzyme, and substrate costs per unit weight of product.
Author

**N83-23847#** Oak Ridge National Lab., Tenn. Chemical Technology Div.

**FIXED-FILM COLUMNAR BIOREACTORS FOR THE PRODUCTION OF CHEMICALS AND FUELS FROM BIOMASS**

Charles D. Scott, S. E. Wes Shumate, II, and Edward J. Arcuri *In* Midwest Research Inst. Biotechnol. for the Production of Chem. and Fuels from Biomass Dec. 1982 p 147-154 refs (For primary document see N83-23833 13-44)
Avail: NTIS HC A09/MF A01

Fixed films of an active biological agent are maintained on solid surfaces within bioreactor systems to allow high productivity without agent washout during continuous operation. This, coupled with a stagewise columnar arrangement, may allow higher overall reaction rates. Fluidized bed and fixed bed bioreactors with fixed films of microorganisms are studied for the production of chemicals and fuels from biomass derived feed materials. Ethanol production at high rates has been demonstrated with glucose as the feed material; methane and other chemicals are also produced in these advanced systems.
Author

**N83-23848#** Midwest Research Inst., Golden, Colo. Biotechnolgy Branch.

**CHEMICAL FEEDSTOCK FROM HARDWOOD BY ORGANOSOLV HYDROLYSIS: COMPUTER-AIDED PROCESS DESIGN AND ECONOMIC EVALUATION**

Xuan N. Nguyen *In its* Biotechnol. for the Production of Chem. and Fuels from Biomass Dec. 1982 p 155-176 refs (For primary document see N83-23833 13-44)
(Grant NSF PFR-77-12243)
Avail: NTIS HC A09/MF A01

A two stage catalyzed organosolv plant producing ethanol, furfural, acetic acid, and soluble lignin from wood waste was investigated. The GEMS computer system was used to aid the preliminary design and cost estimation of the proposed wood chemical plant. For a plant processing 1000 ovendry tons of wood per day, a capital investment of $66 million and an operating expense of about $20 million per year were estimated. The capital cost calculated compares favorably with other published estimates. Sensitivity analyses of some key factors in the proposed process disclose that the recovery efficiency of ethanol used in the lignin extraction stage is most important in determining the process economics. Ethanol solvent recovery of about 98% is required. At 95% recovery efficiency, conversion to glucose in the acid hydrolysis step above 90% is necessary for the ethanol selling price to be comparable to the current market price.
Author

**N83-23849#** Colorado State Univ., Fort Collins. Dept. of Agricultural and Chemical Engineering.

**PRELIMINARY PROCESS ENGINEERING EVALUATION OF ETHANOL PRODUCTION FROM VEGETATIVE CROPS**

Antonio R. Moreira, James C. Linden, Dan H. Smith, and Ruxton H. Villet (Midwest Research Inst.) *In* Midwest Research Inst. Biotechnol. for the Production of Chem. and Fuels from Biomass Dec. 1982 p 177-188 refs (For primary document see N83-23833 13-44)
Avail: NTIS HC A09/MF A01

Vegetative crops show good potential as feedstock for ethanol production via cellulose hydrolysis and yeast fermentation. The low levels of lignin encountered in young plant tissues show an inverse relationship with the high cellulose digestibility during hydrolysis with cellulose enzymes. Ensiled sorghum species and brown midrib mutants of sorghum exhibit high glucose yields after enzyme hydrolysis as well. Vegetative crop materials as candidate feedstocks for ethanol manufacture should continue to be studied. The species studied so far are high value cash crops and result in relatively high costs for the final ethanol product. Unconventional crops, such as pigweed, kochia, and Russian thistle, which can use water efficiently and grow on relatively arid land under conditions not ideal for food production, should be carefully evaluated with regard to their cultivation requirements,

photosynthesis rates, and cellulose digestibility. Such crops should result in more favorable process economics for alcohol production. Author

**N83-23850#** Sandia Labs., Albuquerque, N. Mex. Solar Programs Div.
**THE 10-MWe CENTRAL-RECEIVER SOLAR-THERMAL PILOT PLANT DATA-EVALUATION PLAN**
L. G. Radosevich Dec. 1982 56 p refs
(Contract DE-AC04-76DP-00789)
(DE83-005035; SAND-82-8027) Avail: NTIS HC A04/MF A01

The data evaluation plan for the 10 MWe Central Receiver Solar Thermal Pilot Plant near Barstow, California is discussed. The objective, test and data needs, approach, applicability, expected output, and planned data dissemination are presented for each evaluation. DOE

**N83-23851#** Mueller Associates, Inc., Baltimore, Md.
**BIOMASS ENERGY SYSTEMS: STATUS OF ENVIRONMENTAL, HEALTH AND SAFETY INVESTIGATIONS**
Robert J. Walinchus May 1982 64 p refs
(Contract DE-AC01-81EV-10450)
(DE83-005067; DOE/EV-10450/T3) Avail: NTIS HC A04/MF A01

A synthesis of information and environmental data relevant to biomass energy is presented. Biomass resources and conversion processes are discussed. The environmental impacts from biomass resources are discussed. Land impact, water impact, wetlands impacts, control technology, and occupational health and safety are discussed. DOE

**N83-23852#** Oak Ridge National Lab., Tenn. Engineering Technology Div.
**STUDY OF HYDRAULIC AIR COMPRESSION FOR OCEAN THERMAL ENERGY CONVERSION OPEN-CYCLE APPLICATION**
A. Golshani and F. C. Chen Jan. 1983 8 p refs
(Contract W-7405-eng-26)
(DE83-005155; ORNL/TM-8384) Avail: NTIS HC A02/MF A01

A hydraulic air compressor, which requires no mechanical moving parts and operates in a nearly isothermal mode, can be an alternative for the noncondensible gas disposal of an Ocean Thermal Energy Conversion (OTEC) open-cycle power system. The compressor requires only a downward flow of water to accomplish air compression. An air compressor test loop was assembled and operated to obtain test data that would lead to the design of an OTEC hydraulic air compressor. A one dimensional, hydraulic gas compressor, computer model was employed to simulate the laboratory experiments, and it was tuned to fit the test results. A sensitivity study that shows the effects of various parameters on the applied head of the hydraulic air compression is presented. DOE

**N83-23853#** Marquette Univ., Milwaukee, Wis.
**CONCENTRATION CELLS FOR COMBUSTION IMPROVEMENT. REACTION RATE IN A ZIRCONIUM-YTTRIA SOLID-ELECTROLYTE FUEL CELL Final Report**
Richard Gaggioli and David W. Walker Nov. 1982 100 p refs
(Contract DE-FG01-78ET-12231)
(DE83-002773; DOE/ET-12231/T1) Avail: NTIS HC A05/MF A01

The reaction rate for fuel oxidation in a solid electrolyte fuel cell of zirconium doped with yttria is discussed. An experimental apparatus was developed for measuring cell current and voltage across a load at several fuel and air flow rates at temperatures in the neighborhood of 9500 C. The resultant data was used to deduce two correlations between the reaction rate and chemical affinity. It was found that the reaction rate was essentially independent of the flow rates, over the flow ranges covered by the reliable experimental runs. Another important conclusion following from the experimental results is that, under normal operating conditions, the available energy consumption associated with fuel oxidation kinetics cannot be neglected. For example, close to maximum power, the oxidation consumption is 200 times the electrolyte resistance consumption. These results are not only valuable in themselves, but are utilized in a computer model for simulating the performance of arrays of solid electrolyte fuel cells, as well as the utilization of such arrays for improving the performance of conventional power plants. DOE

**N83-23854#** Washington Univ., Seattle. Office of the Aerospace and Energetics Research Program.
**HIGH-TEMPERATURE INTEGRATED THERMAL-ENERGY-STORAGE SYSTEM FOR SOLAR-THERMAL APPLICATIONS Final Report**
A. P. Bruckner and A. Hertzberg Dec. 1982 112 p refs
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE83-004755; SERI/STR-231-1812) Avail: NTIS HC A06/MF A01

An analysis is presented of a novel, very high temperature solar thermal energy storage system which uses molten slag as the storage medium. Slat bead aggregate is melted in a solar central receiver and stored in liquid form at 16500K in an insulated refractory storage vessel. Sensible heat is extracted from the molten slag in a direct-contact droplet heat exchanger, in which the slag is sprayed as a multitude of droplets through a high pressure counter-flowing working gas. The heated gas is used in a high-temperature regenerative Brayton cycle. The solidified slag droplets are returned to the solar receiver to repeat the cycle. Capital cost and present worth revenue requirement data are developed from a 10 MW sub e point-design electric power system for 1, 6, 15, and 48 hour storage. DOE

**N83-23855#** Sandia Labs., Albuquerque, N. Mex. Geophysics Div.
**MAGMA ENERGY RESEARCH PROJECT Final Report**
John L. Colp Oct. 1982 34 p refs
(Contract DE-AC04-76DP-00789)
(DE83-004761; SAND-82-2377) Avail: NTIS HC A03/MF A01

Scientific feasibility was demonstrated for the concept of magma energy extraction. The US magma resource is estimated at 50,000 to 500,000 quads of energy - a 700- to 7000-yr supply at the current US total energy use rate of 75 quads per year. Existing geophysical exploration systems are believed capable of locating and defining magma bodies and were demonstrated over a known shallow buried molten-rock body. Drilling rigs that can drill to the depths required to tap magma are currently available and experimental boreholes were drilled well into buried molten rock at temperatures up to 11000C. Downhole heat extraction equipment as designed, built, and demonstrated successfully in buried molten rock and in the very hot margins surrounding it. Two methods of generating gaseous fuels in the high-temperature magmatic environment - generation of H2 by the interaction of water with the ferrous iron and H2, CH4, and CO generation by the conversion of water-biomass mixtures - were investigated and show promise. DOE

**N83-23856#** Idaho Dept. of Water Resources, Boise.
**WATER INFORMATION BULLETIN NO. 30: GEOTHERMAL INVESTIGATIONS IN IDAHO. PART 11: GEOLOGICAL, HYDROLOGICAL, GEOCHEMICAL AND GEOPHYSICAL INVESTIGATIONS OF THE NAMPA-CALDWELL AND ADJACENT AREAS, SOUTHWESTERN IDAHO**
John C. Mitchell, ed. Dec. 1981 153 p refs
(Contract DE-AS07-77ET-28407)
(DE82-020789; DOE/ET-28407/T2) Avail: NTIS HC A08/MF A01

The area under study included approximately 925 sq km (357 sq mi) of the Nampa-Caldwell portion of Canyon County, an area within the central portion of the western Snake River Plain immediately west of Boise, Idaho. Geologic mapping, hydrologic, geochemical, geophysical, including detailed gravity and aeromagnetic surveys, were run to acquire needed data. In addition, existing magnetotelluric and reflection seismic data were purchased and reinterpreted in light of newly acquired data. DOE

**N83-23857#** California Dept. of Conservation, Sacramento. Div. of Mines and Geology.
**RECONNAISSANCE GEOTHERMAL RESOURCE ASSESSMENT OF 40 SITES IN CALIFORNIA**
Eddie Leivas, Roger C. Martin, Chris T. Higgins, and Stephen P. Bezore 1981 251 p refs
(Contract DE-FG03-80SF-10855)
(DE82-022220; DOE/SF-10855-82/4; OFR-82-4-SAC) Avail: NTIS HC A12/MF A01

Results are set forth for a continuing reconnaissance-level assessment of promising geothermal sites scattered through California. Involved is the acquisition of new data based upon field observations, compilation of data from published and unpublished sources, and evaluation of the data to identify areas suitable for more intensive area-specific studies. Forty sites were chosen for reporting on the basis of their relative potential for development as a significant resource. The name and location of each site is given, and after a brief synopsis, the geothermal features, chemistry, geology, and history of the site are reported. Three sites are recommended for more detailed on the basis of potential for use by a large number of consumers, large volume of water, and the likelihood that the resource underlies a large area. DOE

**N83-23858#** Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
**STATE GEOTHERMAL COMMERCIALIZATION PROGRAMS IN SEVEN ROCKY MOUNTAIN STATES Semiannual Progress Report, Jul. - Dec. 1981**
B. C. Lunis, ed. Aug. 1982 201 p refs
(Contract DE-AC07-76ID-01570)
(DE82-021076; DOE/ID-12101/5) Avail: NTIS HC A10/MF A01

The activities and findings of the seven state commercialization teams participating in the Rocky Mountain Basin and Range commercialization program are described. The period covered is July through December 1981. Background information is provided, program objectives and the technical approach used are discussed, and the benefits of the program are described. Prospect identification, area development plans, site specific development analyses, time-phased project plans, the aggregated prospective geothermal energy use, and institutional analyses are discussed. Public outreach activities are covered and findings and recommendations are summarized. DOE

**N83-23859#** Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
**DIRECT-CONTACT THERMAL-STORAGE RESEARCH**
J. O. Wright and M. S. Bohn Aug. 1982 9 p refs Presented at Energy Storage Contractors Rev. Meeting, Arlington, Va., 23 Aug. 1982
(Contract DE-AC02-77CH-00178)
(DE82-020989; SERI/TP-252-1691; CONF-820827-21) Avail: NTIS HC A02/MF A01

The objective of the direct-contact thermal storage research task is to reduce the heat-transfer-related costs of thermal energy storage systems by performing research on direct-contact heat transfer. Research is presently focused on direct contact between air and molten nitrate salts. These devices have cost advantages over conventional fin-tube indirect heat exchangers and would be used to couple short-term molten salt storage to longer term air/rock storage to obtain long duration storage. Heat transfer was adequate, but some practical operating problems remained. The problem of oil distribution was resolved, but no solution was found for the problem of salt hydrate carryover. Because of the carryover problem, because latent heat storage in direct-contact salt hydrate systems offers only small reductions in storage volume, and because there is little potential for cost reduction compared to water storage, further research on such systems is not recommended. DOE

**N83-23860#** Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
**ANALYSIS OF THERMAL-STORAGE SYSTEMS**
Robert J. Copeland Aug. 1982 8 p Presented at the Energy Storage Contractors Rev. Meeting, Arlington, Va., 23-26 Aug. 1982
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE82-020981; SERI/TP-252-1685; CONF-820827-22) Avail: NTIS HC A02/MF A01

During FY 1982, thermal storage systems were analyzed for solar thermal applications. Promising thermal storage concepts were identified for a liquid metal receiver in an electric power application. Both an advanced, high-temperature (1100 C maximum) molten salt system and a double-effort solar cooling system were assessed. Both systems with associated thermal storage were promising. Currently, a long duration storage system with a molten nitrate salt central receiver is being assessed. DOE

**N83-23861#** Arinc Research Corp., Annapolis, Md.
**RELIABILITY AND AVAILABILITY ASSESSMENTS OF SELECTED DOMESTIC COMBINED-CYCLE POWER-GENERATING PLANTS Final Report**
H. W. Brown and N. J. Gardner Aug. 1982 104 p refs Sponsored by EPRI
(EPRI Proj. 1319-6)
(DE82-905494; EPRI-AP-2536) Avail: NTIS HC A06/MF A01

This report presents the results of reliability and availability assessment performed with the cooperation of seven utilities operating combined-cycle power plants in service since 1974 to evaluate: combined-cycle unit equivalent availability and equivalent forced outage rates; system and component mean time between failures (MTBF) and mean downtime (MDT); and gas turbine reliability correlations with service hours, starting frequency, fuel type, and service factor. A data base was developed for 45 plant components or systems for the period 1978 through 1980; this led to recommendations for improving outage data collection for the purpose of reliability analysis. In addition reliability, availability, and maintainability prediction models for several commercial combined cycle plant designs were developed and validated. DOE

**N83-23862#** Arizona Public Service Co., Phoenix.
**DIRECT FLASH STEAM GEOTHERMAL POWER PLANT ASSESSMENT Final Report**
T. E. Alt Jan. 1982 83 p refs Sponsored by EPRI
(EPRI Proj. 1195-1)
(DE82-902096; EPRI-AP-2162) Avail: NTIS HC A05/MF A01

The objective was to analyze the capacity and availability factors of an operating direct flash geothermal power plant. System and component specifications, operating procedures, maintenance history, malfunctions, and outage rate are discussed. The plant studied was the 75 MW(e) geothermal power plant at Cerro Prieto, Mexico, for the years 1973 to 1979. To describe and assess the plant, the project staff reviewed documents, visited the plant, and met with staff of the operating utility. The high reliability and availability of the plant was documented and actions responsible for the good performance were identified and reported. The results are useful as guidance to US utilities considering use of hot water geothermal resources for power generation through a direct flash conversion cycle. DOE

**N83-23863#** Los Alamos Scientific Lab., N. Mex.
**THE DEPARTMENT OF DEFENSE ENERGY VULNERABILITIES: POTENTIAL PROBLEMS AND OBSERVATIONS**
D. A. Freiwald, M. E. Berger, and J. F. Roach Aug. 1982 52 p refs
(Contract W-7405-eng-36)
(DE82-021140; LA-9485-MS) Avail: NTIS HC A04/MF A01

The Department of Defense is almost entirely dependent on civilian energy supplies to meet its needs in both peacetime and periods of heightened conflict. There are a number of potential vulnerabilities to the continual and timely supply of energy to both the civilian and military sectors. These include denial of the energy resources themselves, disruption of critical transportation networks, destruction of storage facilities, and interruption of electrical power. This report briefly reviews the present situation for provision of energy from the civilian sector to the military. General vulnerabili-

ties of the existing energy supply system are identified, along with the potential for armed aggression (including terrorist and sabotage activities) against the energy network. Conclusions and some tentative observations are made as to a proper response to the existing vulnerabilities. DOE

**N83-23864#** Technical Information Center, Oak Ridge, Tenn.
**ENERGYGRAMS: BRIEF DESCRIPTIONS OF ENERGY TECHNOLOGY**
W. F. Simpson, Jr., ed. 1982 95 p refs
(DE82-003279; DOE/TIC/EGC-82/2) Avail: NTIS HC A05/MF A01

Energygrams: Brief Descriptions of Energy Technology, is a compilation of technical notes (called Energygrams) published by the Technical Information Center. The Center instituted the Energygram program to help fulfill a mission of the US Department of Energy (DOE) to transfer information and technology generated from DOE-sponsored research to identifiable audiences in industry, education, and federal, state, and local government. The Technical Information Center routinely screens all DOE R and D reports to identify appropriate information. It also coordinates with DOE and DOE laboratory and contractor program managers in identifying research and development projects for the transfer program and in reviewing the technical content of Energygrams before publications. Energygrams are usually one-page illustrated bulletins describing DOE technology or data and telling how to obtain the technical reports or other material on which they are based. DOE

**N83-23865#** Lockheed Missiles and Space Co., Palo Alto, Calif. Metalurgy Lab.
**MATERIALS FOR SYNGAS COOLERS Final Report**
R. A. Perkins, G. Morse, and W. C. Coons Aug. 1982 187 p refs Sponsored by EPRI
(EPRI Proj. 1654-5)
(DE82-906452; EPRI-AP-2518) Avail: NTIS HC A09/MF A01

A technical basis for materials selection and laboratory testing of practical boiler tube materials which will provide reliable long term service in syngas coolers for coal gasification combined cycle power plants is outlined. The resistance of low alloy steel, stainless steels, and aluminum rich coatings to attach by a high sulfur, medium Btu coal gasification atmosphere was evaluated at 300 to 500 deg C. The materials may have adequate resistance for long time service in radiant coolers operating up to 500 deg C on high sifur medium Btu gas. Performance is analyzed for thermodynamic and kinetic properties and recommendations for long term tests and development of protective coatings are presented. DOE

**N83-23866#** Little (Arthur D.), Inc., Cambridge, Mass.
**WIND ENERGY CONVERSION SYSTEM ANALYSIS MODEL (WECSAM) COMPUTER PROGRAM DOCUMENTATION**
William T. Downey and Peter L. Hendrick Golden, Colo. Solar Energy Research Inst. Jul. 1982 78 p refs Prepared for Midwest Research Inst., Golden, Colo.
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE82-021014; SERI/SP-19136-4) Avail: NTIS HC A05/MF A01

Described is a computer-based wind energy conversion system analysis model (WECSAM) developed to predict the technical and economic performance of wind energy conversion systems (WECS). The model is written in CDC FORTRAN V. The version described accesses a data base containing wind resource data, application loads, WECS performance characteristics, utility rates, state taxes, and state subsidies for a six state region (Minnesota, Michigan, Wisconsin, Illinois, Ohio, and Indiana). The model is designed for analysis at the county level. The computer model includes a technical performance module and an economic evaluation module. The modules can be run separately or together. The model can be run for any single user-selected county within the region or looped automatically through all counties within the region. In addition, the model has a restart capability that allows the user to modify any data-base value written to a scratch file prior to the technical or economic evaluation. DOE

**N83-23867#** Oak Ridge National Lab., Tenn. Engineering Technology Div.
**ANALYSIS OF FIXED-BASE FLYWHEEL SYSTEMS FOR ELECTRIC-UTILITY APPLICATIONS**
Mitchell Olszewski 1982 6 p refs Presented at the 17th Intersoc. Energy Conversion Eng. Conf., Los Angeles, 8 Aug. 1982
(Contract W-7405-eng-26)
(DE82-020809; CONF-820814-27) Avail: NTIS HC A02/MF A01

The potential role for flywheels as a utility storage option and establish research and development priorities for fixed base flywheel systems were assessed. The demand for electricity exhibits diurnal, weekly, and seasonal variations. Because of these variations utilities experience off-peak times when the baseload generation capacity is not fully utilized. They experience on peak loads substantially in excess of baseload generation capability. The use of energy storage allows the cheaper base load generation to be used in place of expensive oil-fired combustion turbine power for peaking applications. The very short-term peaking spikes experienced by utilities were studied. This represents about 4% of the total annual amount of energy generated by utilities but about 13% of the total fuel costs. DOE

**N83-23868#** Union Carbide Corp., Oak Ridge, Tenn. Nuclear Div.
**DEVELOPMENT OF HEAT STORAGE BUILDING MATERIALS**
P. Grodzka (Lockheed Corp.), J. Price (Lockheed Corp.), C. Serbin, and A. Solomon 1982 4 p refs Presented at the 17th Intersoc. Energy Conversion Eng. Conf., Los Angeles, 8 Aug. 1982
(Contract W-7405-eng-26)
(DE82-020814; CONF-820814-23) Avail: NTIS HC A02/MF A01

A heat storage building material concept currently under investigation consists of incorporating phase change material (PCM) into double-walled hollow-channeled plastic wallboard of approximately 1/4 inch thickness. The resulting panels will be in the form of thin sheets, approximately 4 x 8 square feet in area. The possible PCM's under study include Glauber's salt, calcium chloride hexahydrate, and lithium nitrate trihydrate. The aim of the panel is to increase the thermal inertia of the building structure and in this way to make possible significant energy savings for the structure. In this paper we describe our study of this concept and of the broader question of its impact on the house load and comfort, as it has proceeded thus far. In particular, we sketch the results of a preliminary analysis of the behavior of the PCM's and PCM panels for various heat input modes. Mathematical modeling techniques for a building are described. DOE

**N83-23869#** Motorola, Inc., Scottsdale, Ariz. Government Electronics Div.
**ADVANCED CONCENTRATOR CELL-MOUNT ANALYSIS Final Report**
Keith Kingston Nov. 1982 191 p refs
(Contract DE-AC04-76DP-00789)
(DE83-003835; SAND-82-7119) Avail: NTIS HC A09/MF A01

Eight advanced photovoltaic concentrator cell-mount configurations for use in the 50 to 200X concentration range have been designed, modeled and tested. Six of these mount types utilize a 1.75-cm-square cell and two use a 7.6-cm-diameter cell. An elastic-plastic computer stress model employing SAP6 was developed for seven of the designs. This stress analysis predicts maximum cell stress and provides information for predicting solder-joint fatigue life. Several empirical methods were attempted to provide support for the analysis. Present solder-joint evaluation techniques were investigated and ranked according to their effectiveness in engineering and production applications. Eighty-two functioning cell mounts of the various configurations were fabricated using both Sn62 and INnumber2 solder and exposed to 56 days of accelerated temperature and temperature/humidity cycling. Performance was tested at two-week intervals throughout the cycling. Initial mount performance and the degradation due to environmental cycling is described. Also presented are the design details and costs of the various mount configurations for production quantities of 50 kW and 1 MW per year. DOE

**N83-23870#** Illinois Inst. of Tech., Chicago. Dept. of Mechanical Engineering.
**FEASIBILITY OF A MEDIUM-SIZE CENTRAL COGENERATED ENERGY FACILITY, ENERGY MANAGEMENT MEMORANDUM**
Robert W. Porter Sep. 1982 35 p refs
(Contract DE-FG02-80CS-40337)
(DE83-005084; DOE/CS-40337/7; TN-82-7) Avail: NTIS HC A03/MF A01

The thermal-economic feasibility was studied of a medium-size central cogenerated energy facility designed to serve five varied industries. Generation options included one dual-fuel diesel and one gas turbine, both with waste heat boilers, and five fired boilers. Fuels included natural gas, and for the fired-boiler cases, also low-sulphur coal and municipal refuse. The fired-boiler cogeneration systems employed back-pressure steam turbines. For coal and refuse, the option of steam only without cogeneration was also assessed. The refuse-fired cases utilized modular incinerators. The options provided for a wide range of steam and electrical capacities. Deficient steam was assumed generated independently in existing equipment. Excess electrical power over that which could be displaced was assumed sold to Commonwealth Edison Company under PURPA (Public Utility Regulator Policies Act). The facility was assumed operated by a mutually owned corporation formed by the cogenerated power users. The economic analysis was predicted on currently applicable energy-investment tax credits and accelerated depreciation for a January 1985 startup date. Based on 100% equity financing, the results indicated that the best alternative was the modular-incinerator cogeneration system. DOE

**N83-23871#** Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
**LINE-FOCUS RECEIVER HEAT LOSSES**
Douglas A. Dougherty Jul. 1982 36 p refs
(Contract DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE82-019165; SERI/TR-632-868) Avail: NTIS HC A03/MF A01

The results are presented by laboratory experiments made to determine the magnitude of thermal losses characteristic of several line-focus receiver designs as functions of the absorbing surface temperature and to determine which configurations are most effective in reducing receiver heat losses. Designs tested were a simple glass-jacketed receiver, a back-reflecting receiver, a back-insulated receiver, and an evacuated jacket receiver. The evacuated jacket receiver demonstrated very low heat losses, but would have to be operated at very high temperatures and could be marked by some cost-effective design techniques into receivers, designers can make collectors and total systems more efficient and more competitive with other designs. DOE

**N83-23872#** New Mexico Univ., Albuquerque. Dept. of Mechanical Engineering.
**EXPERIENCE WITH THERMAL STORAGE IN TANKS OF STRATIFIED WATER FOR SOLAR HEATING AND LOAD MANAGEMENT**
Maurice W. Wildin, Mark P. Witkofsky (Knolls Atomic Power Lab., Schenectady, N.Y.), John M. Noble (Public Service Co. of N. Mex., Albuquerque), Robert E. Hopper (Bridgers and Paxton Consulting Engineers, Inc., Albuquerque, N. Mex.), and Peter G. Stromberg 1982 17 p Presented at the ASHRAE Natl. Meeting, Toronto, 27 Jun. 1982 Prepared in cooperation with ORNL, Tenn.
(Contract W-7405-eng-26)
(DE82-017421; CONF-820664-2) Avail: NTIS HC A02/MF A01

Results have been obtained for performance of stratified tanks of water used to store heating and cooling capacity in a 5574 sq m university building. The major sources of energy used to charge the heated tanks were solar energy, obtained via collectors on the roof of the building, and excess heat recovered from the interior of the building via thermal storage and electric-driven heat pump/chillers. Through stratification of the water in the storage tanks and an appropriate system operating strategy, 40 percent of the building's total heating needs were supplied by solar energy during the first four months of 1981. Month-long thermal efficiencies of the storage array ranging from 70 percent during the heating season to nearly 90 percent during the cooling season, were measured. Work is underway to improve the performance of thermal storage. DOE

**N83-23873#** Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
**SERI SOLAR ENERGY STORAGE PROGRAM Annual Report**
Frank Baylin, Robert J. Copeland, Alex Kotch, Thomas Kriz, Werner Luft, R. Gerald Nix, and John O. Wright May 1982 67 p refs
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE82-019161; SERI/PR-231-1570) Avail: NTIS HC A04/MF A01

Thermal energy storage technologies are identified for specific solar thermal applications. The capabilities and limitations of direct-contact thermal storage and thermochemical energy storage and transport are examined. Storage of energy from active solar thermal systems for industrial process heat and the heating of buildings is analyzed and seasonal energy storage is covered. The coordination of numerous thermal energy storage research and development activities is described. DOE

**N83-23874#** Midwest Research Inst., Golden, Colo.
**INTERFACES IN SOLAR-ENERGY MATERIALS**
A. W. Czanderna Feb. 1982 18 p refs Presented at Electrochem. Soc. Conf., Denver, Colo., 11 Oct. 1981
(Contract DE-AC02-77CH-00178)
(DE82-008680; SERI/TP-255-1499) Avail: NTIS HC A02/MF A01

The importance is summarized of various methods for studying the stability of interfaces in solar energy materials and of the interfaces. An overview is given that explains why interfaces are crucially important for developing long-life, cost-effective, multilayers, polycrystalline, thin-film stacks for solar energy conversion systems (SECS). Second broad categories of characterization methods, approaches, and processes in interface science are reviewed and related to studies for components in SECS, in which the importance of compositional analysis of interfaces is emphasized. These include surface area, real and clean surfaces, structure and topography, interface composition or purity, surface thermodynamics, diffusion, amount absorbed, and nature of adsorbate/solid interactions. Third, an overview is given for the solar-related research needs and opportunities in various topical areas in interface science. DOE

**N83-23875#** TriSolar Corp., Bedford, Mass.
**DESIGN AND FABRICATION OF A PROTOTYPE SYSTEM FOR PHOTOVOLTAIC RESIDENCES IN THE NORTHEASTERN UNITED STATES Final Report**
Alan R. Millner Aug. 1982 81 p refs
(Contract DE-AC02-76ET-20279)
(DE82-022236; DOE/ET-20279/217) Avail: NTIS HC A05/MF A01

Plans for an energy-efficient residence for the Northeastern region of the country with a roof-mounted photovoltaic (PV) solar electric power system which would allow two-way power flow between the utility grid and the house are discussed. A full scale working prototype of the PV system was built to evaluate the performance of that system for one year. Described are the residence design, the prototype description, the construction, and the fabrication history through the first year of operation. DOE

**N83-23876#** California Univ., Livermore. Lawrence Livermore Lab.
**OVERVIEW OF SOLAR-ENERGY SYSTEMS FOR ELECTRICITY PRODUCTION: COMPARISON BY COST AND EFFICIENCY**
John C. Whitehead 23 Jul. 1982 27 p refs
(Contract W-7405-eng-48)
(DE82-022516; UCID-19500) Avail: NTIS HC A03/MF A01

Pertinent data are tabulated for eight solar energy conversion methods: algal biomass, agricultural biomass, biophotolysis, salt gradient solar pond, ocean thermal energy conversion, concentrated solar thermal power, silicon solar cells, and propeller wind turbines. Justifications are given for the table entries. For each system, the theoretical maximum efficiencies of the energy

conversion steps are compared with actual obtained values, and attempts are made to explain the differences. DOE

**N83-23877#** Brookhaven National Lab., Upton, N. Y. Materials Chemistry and Energy Conversion Div.
**TEST BED FOR ADVANCED HYDROGEN TECHNOLOGY: PHOTOVOLTAIC ARRAY/ELECTROLYZER SYSTEM**
Gerald Strickland Aug. 1982 6 p ref Presented at the Energy Storage Contractors Rev. Meeting, Arlington, Va., 23-27 Aug. 1982
(Contract DE-AC02-76CH-00016)
(DE82-021745; BNL-31724; CONF-820827-16) Avail: NTIS HC A02/MF A01

The primary objective of the project is to establish an integrated test bed that will illustrate advanced technology for the far term. Installation of the test bed would be at the site of the Hydrogen Technology Advanced Component Test System (HYTACTS), a service system constructed several years ago and used for testing a hydride hydrogen storage vessel capable of storing 50 lb of hydrogen as a metal hydride. The HYTACTS provides services essential for hydrogen flow, as well as those for thermal control. Most operations are performed remotely from an indoor control panel outfitted with suitable instrumentation. A second objective of the project is to test and evaluate the photovoltaic array/advanced technology electrolyzer (PVA/ATE) system under practical conditions. Operation of the ATE in the transient mode, as determined by the local insolation, is the key part of the experimental program. At an appropriate time, IEA participants and interested commercial parties will be invited to operate the system as a tutorial exercise. DOE

**N83-23878#** Budd Co., Fort Washington, Pa. Technical Center.
**DEVELOPMENT OF SHEET-METAL PARABOLIC-TROUGH REFLECTOR PANELS**
Albert W. Biester Jun. 1982 79 p
(Contract DE-AC04-76DP-00789)
(DE82-016377; SAND-81-7038) Avail: NTIS HC A05/MF A01

Efforts to develop accurate, durable, and mass producible sheet metal parabolic trough solar collectors and the associated support for the collectors are described. The design considered is similar to an automobile hood, a two-piece sheet metal structure consisting of a formed steel frame or stiffening panel and a smooth contoured skin. The two pieces may be bonded or welded to form a rigid structure, and a reflective surface applied such as a film, glass mirror, or any of the presently utilized materials. The work encompassed material selection, adhesive selection and testing, tool design and fabrication, prototype panel production, and design and development of torque tube assemblies on which the trough is inclined. Results of adhesive bonding studies are given. It is found that high volume technology can be used to produce accurate and structurally sound reflector panels, and one configuration was selected for fabrication in suitable quantities for performance testing. DOE

**N83-23879#** Mound Lab., Miamisburg, Ohio.
**HEAT EXTRACTION FROM A LARGE SOLAR POND**
Layton J. Wittenberg and Don E. Etter Aug. 1982 6 p refs Presented at the ASME Winter Ann. Meeting, Phoenix, Ariz., 15-19 Nov. 1982
(Contract DE-AC04-76DP-00053)
(DE82-019322; MLM-2962-OP; CONF-821101-9) Avail: NTIS HC A02/MF A01

The largest operational, salt-gradient solar pond in the United States, occupying 2000 squares meters, was constructed during 1978 in Miamisburg, Ohio. The heat from this solar pond, nearly 1055 GJ/y (1000 million Btu/y) is used to heat an outdoor swimming pool in the summer and an adjacent recreation building during part of the winter. A new heat exchanger system was installed externally to the pond and operated successfully to deliver 391 GJ (271 million Btu) of heat during May to June. Hot brine water is drawn through a diffuser by a self-priming pump fabricated from fiberglass reinforced plastic. The brine water passes through copper 10% nickel tubes of a tube-and-shell heat exchanger and is then returned to the bottom of the pond. Cooling water from the swimming pool circulates through the shell side of the heat exchanger. Several designs and flow velocities of the brine inlet and outlet diffusers into the pond were tested in order to minimize the effect of turbulence upon the salt gradient zone. DOE

**N83-23880#** Los Alamos Scientific Lab., N. Mex. Solar Energy Group.
**DOE PASSIVE-SOLAR CLASS A PERFORMANCE-EVALUATION PROGRAM: PRELIMINARY RESULTS**
B. D. Hunn, W. V. Turk, and W. O. Wray 1982 10 p refs Presented at the Passive and Hybrid Solar Energy Update Conf., Washington, D. C., 15-17 Sep. 1982
(Contract W-7405-eng-36)
(DE82-021761; LA-UR-82-2497; CONF-820940-1) Avail: NTIS HC A02/MF A01

Elements of the plan for the DOE passive solar class A performance evaluation program are given. A proposed validation methodology, including both analytical and empirical tests, a quantitative definition of validation, minimum data requirements, and a standard reporting format, is outlined. The preliminary testing of this methodology using hourly data from two Class A test facilities is presented. Finally, the collection, analysis, and documentation of preliminary data sets is discussed. DOE

**N83-23881#** Los Alamos Scientific Lab., N. Mex.
**SOME POTENTIAL BENEFITS OF FUNDAMENTAL RESEARCH FOR THE PASSIVE SOLAR HEATING AND COOLING OF BUILDINGS**
Donald A. Neeper and Robert D. McFarland Aug. 1982 45 p refs
(Contract W-7405-eng-36)
(DE82-021257; LA-9425-MS) Avail: NTIS HC A03/MF A01

Potential benefits of fundamental research in materials, control of optical radiation, and enhancement of heat transfer are examined. A brief survey is given of the environmental resource for supplying the heating and cooling energy needs of buildings. It is concluded that the resource is adequate to meet most heating needs and approximately half the cooling needs by passive technology. However, for this resource to be exploited, the efficiency and control of passive systems must be dramatically increased. Hypothetical, but physically realistic, models for system improvements resulting from fundamental research are tested in hour by hour simulations of building energy flows. It was found that the expected improvement could double the efficiency of passive heating systems and permit use of any part of the building envelope for energy gain. Expected benefits in optical control could greatly reduce cooling loads. Specific examples of needed research in optical materials and heat transfer are identified. DOE

**N83-23882#** Chicago Bridge and Iron Co., Ill.
**DETAILED DESIGN FOR INCORPORATING CBI CAPACITIVE COOLING SYSTEM IN THE ACT FACILITY IN BAKERSFIELD, CALIFORNIA. VOLUME 1: EXECUTIVE SUMMARY Final Report**
R. J. Naegelen, J. L. Seale, and M. Husain Jul. 1982 21 p refs Sponsored by EPRI
(EPRI Proj. 1260-27)
(DE82-905805; EPRI-CS-2463-Vol-1) Avail: NTIS HC A02/MF A01

Adding of the capacitive cooling system to the existing advanced concepts test (ACT) was studied. The ACT Facility demonstrates a capacitive cooling system used in conjunction with an ammonia based drycooling system. The feasibility to add on the system to the ACT Facility was determined. All design, detail engineering, and construction planning is completed so that the construction phase of the project can proceed. The information on which the feasibility of this addition is summarized. DOE

**N83-23883#** Oak Ridge National Lab., Tenn.
**ANALYSIS OF THE HARMONICS AND POWER-FACTOR EFFECTS AT A UTILITY-INTERTIED PHOTOVOLTAIC SYSTEM**
G. L. Campen 1982 10 p refs Presented at IEEE Power Engr.

Soc. Summer Meeting, San Francisco, 18 Jul. 1982
(Contract W-7405-eng-26)
(DE82-018257; CONF-820735-2) Avail: NTIS HC A02/MF A01

The harmonics and power factor characteristics and effects of a single residential photovoltaic (PV) installation using a line commutated inverter are outlined. The data were taken during a 5 day measurement program at a prototype residential PV installation in Arizona. The magnitude and phase of various currents and voltages from the fundamental to the 13th harmonic were recorded both with and without the operation of the PV system. A candidate method of modeling the installataion for computer studies of larger concentrations is given. DOE

**N83-23884#** Colorado Univ., Boulder.
**SENSITIZATION AND QUENCHING IN THE CONVERSION OF LIGHT ENERGY INTO CHEMICAL ENERGY Annual Progress Report, 1 Feb. 1982 - 31 Jan. 1983**
S. J. Cristol Aug. 1982 11 p refs
(Contract DE-AC02-79ER-10366)
(DE82-0211592; DOE/ER-10366/4) Avail: NTIS HC A02/MF A01

The photorearrangements of several dibenzobarreleness to dibenzo cyclo octatetraenes (singlet reactions), the quenching of that process, and the accompanying sensitization to give dibenzo semibull valenes, as mediated by acetone concentration was studied. This work demonstrated, the plausibility of a relay mechanism in which an excited singlet of a reactant, produced by direct irradiation, is quenched, the quencher intersystem crosses to its triplet state and then retransfers energy to the reactant molecule to give its triplet, which does its own chemistry. Work aimed at determining substituent effects on excited state reaction rate constants and reactivities was continued. Work on excitation transfer geometry and on oxidation potential requirements in excited bichromophoric molecules is in progress as is work on lifetime measurements of certain excited singlet and triplet states. DOE

**N83-23885#** MelTek Associates, Inc., Shoreview, Minn.
**WIND DRIVEN LIGHTING DEVICE Final Technical Report**
C. J. Michaud 30 Apr. 1982 37 p
(Contract DE-FG02-80R5-10237)
(DE83-001876; DOE/R5-10237/1) Avail: NTIS HC A03/MF A01

The design and development of a prototype model of a wind driven lighting device, to be installed similar to a post light, for home and farmyard lighting are described. Several turbines were tested. Work on an alternator to produce power at wind speeds as low as 8 mph is described. DOE

**N83-23886#** Grace (W. R.) and Co., Memphis, Tenn. Agricultural Chemicals Group.
**PROCESS ENGINEERING AND MECHANICAL DESIGN REPORTS. VOLUME 2: PRELIMINARY DESIGN AND ASSESSMENT OF A 50,000 BPD COAL-TO-METHANOL-TO-GASOLINE PLANT**
Aug. 1982 467 p Prepared in cooperation with Parsons (Ralph M.) Co., Pasadena, Calif. 5 Vol.
(Contract DE-FC02-80ET-14759)
(DE83-000856; DOE/ET-14759/T1-Vol-2-14) Avail: NTIS HC A20/MF A01

Units 11 to 39 of a coal-to-ethanol-to-gasoline fuel production plant are described. The design is basis given as are flowsheets and equipment lists. A risk assessment is included in each case. DOE

**N83-23887#** Grace (W. R.) and Co., Memphis, Tenn. Agricultural Chemicals Group.
**PROCESS ENGINEERING AND MECHANICAL DESIGN REPORTS. VOLUME 3: PRELIMINARY DESIGN AND ASSESSMENT OF A 50,000 BPD COAL-TO-METHANOL-TO-GASOLINE PLANT**
Aug. 1982 336 p Prepared in cooperation with Parsons (Ralph M.) Co., Pasadena, Calif. 5 Vol.
(Contract DE-FC02-80ET-14759)
(DE83-000899; DOE/ET-14759/T1-Vol-3-14) Avail: NTIS HC A15/MF A01

Auxiliary systems designs for a coal-to-methanol-to-gasoline production plant are given. Fine protection, waste disposal and treatment, and maintenance data are given. DOE

**N83-23888#** Grace (W. R.) and Co., Memphis, Tenn. Agricultural Chemicals Group.
**PROCESS ENGINEERING AND MECHANICAL DESIGN REPORTS. VOLUME 5. PRELIMINARY DESIGN AND ASSESSMENT OF A 50,000 BPD COAL-TO-METHANOL-TO-GASOLINE PLANT**
Aug. 1982 560 p Prepared in cooperation with Parsons (Ralph M.) Co., Pasadena, Calif. 5 Vol.
(Contract DE-FC02-80ET-14759)
(DE83-000855; DOE/ET-14759/T1-Vol-4-14) Avail: NTIS HC A24/MF A01

Equipment data sheets for a coal to methanol to gasoline production plant are given. DOE

**N83-23889#** Grace (W. R.) and Co., Memphis, Tenn. Agricultural Chemicals Group.
**PROCESS ENGINEERING AND MECHANICAL DESIGN REPORTS. VOLUME 5: PRELIMINARY DESIGN AND ASSESSMENT OF A 50,000 BPD COAL-TO-METHANOL-TO-GASOLINE PLANT**
Aug. 1982 541 p Prepared in cooperation with Parsons (Ralph M.) Co., Pasadena, Calif. 5 Vol.
(Contract DE-FC02-80ET-14759)
(DE83-000866; DOE/ET-14759/T1-Vol-5-14) Avail: NTIS HC A23/MF A01

Equipment data sheets and other data on automatic control equipment for a coal-to-methanol-to-gasoline fuel production plant are given. Data on operating panels, programmable logic controllers, and conveyor equipment are given. DOE

**N83-23890#** Jacobson (Ray O.), Pengilly, Minn.
**REPORT OF INVESTIGATION FOR HYDROELECTRIC GENERATION Final Report**
Ray O. Jacobson 16 Nov. 1982 72 p refs Sponsored in part by the Biwabik Public Commission
(Contract DE-FG02-81R5-10311)
(DE83-004798; DOE/R5-10311/2) Avail: NTIS HC A04/MF A01

The lowering cost of electricity to consumers by utilizing local rivers for the generation of power was studied. Northern Minnesota has many rivers and streams but has a relatively flat terrain. The principal power company of the area, Minnesota Power, generates electricity from the St. Louis, Mississippi, Crow Wing, and Kawishiwi Rivers. Existing dam sites were studied. Correlating the costs with the sites, it is found that the development of any of the selected sites is not feasible. The high cost of new generating equipment and the high interest rates make the generation of power from the low head/low flow sites uneconomical. DOE

**N83-23891#** Boeing Computer Services, Inc., Seattle, Wash.
**INTERMEDIATE PHOTOVOLTAIC SYSTEM APPLICATION EXPERIMENT OPERATIONAL PERFORMANCE REPORT. VOLUME 13: FOR NEWMAN POWER STATION, EL PASO, TEXAS**
Sep. 1982 27 p Prepared for Sandia Labs., Albuquerque, N. Mex.
(Contract DE-AC04-76DP-00789)
(DE83-000800; SAND-81-7086-13) Avail: NTIS HC A03/MF A01

The data accumulated during June at the intermediate photovoltaic project are measured. Generated energy and environmental (weather) data are presented graphically. Explanations of irregularities not attributable to weather are provided. DOE

**N83-23892#** Chicago Univ., Ill.
**INTEGRATED FUNCTION NONIMAGING CONCENTRATING COLLECTOR TUBES FOR SOLAR THERMAL ENERGY Final Technical Report**
Roland Winston and Joseph J. OGallagher Sep. 1982 61 p refs

(Contract DE-AC02-80ER-10558)
(DE83-001120; DOE/ER-10558/3) Avail: NTIS HC A04/MF A01

A substantial improvement in optical efficiency over contemporary external reflector evacuated tube collectors has been achieved by integrating the reflector surface into the outer glass envelope. Described are the design fabrication and test results for a prototype collector based on this concept. A comprehensive test program to measure performance and operational characteristics of a 2 sq m panel (45 tubes) has been completed. Efficiencies above 50% relative to beam at 200 C have been repeatedly demonstrated. Both the instantaneous and long term average performance of this totally stationary solar collector are comparable to those for tracking line focus parabolic troughs. The yield, reliability and stability of performance achieved have been excellent. Subcomponent assemblies and fabrication procedures have been used which are expected to be compatible with high volume production. The collector has a wide variety of applications in the 100 to 300 C range including industrial progress heat, air conditioning and Rankine engine operation. Author

**N83-23893#** Institute of Gas Technology, Chicago, Ill.
**COAL CONVERSION SYSTEM TECHNICAL DATA BOOK**
Aug. 1982 336 p refs
(Contract DE-AC01-81FE-05157)
(DE83-000224; DOE/FE-05157/2) Avail: NTIS HC A15/MF A01

Sections of the Coal Conversion Systems Technical Data Book cover large coal deposits of the US coal rank, amount, proximate and ultimate analysis, sulfur, calorific value, swelling index, gas solids transport, fluidization, gas particulates separation (electrostatic precipitators, baghouses, cyclone separators, wet scrubbers, granular bed filters), and subject indexes for the whole data book. DOE

**N83-23894#** Sandia Labs., Albuquerque, N. Mex.
**REPORTING OF OPERATIONAL RESULTS FROM INTERMEDIATE-SIZED PHOTOVOLTAIC SYSTEMS**
C. B. Rogers, T. D. Harrison, H. H. Baxter, and H. D. Pruett 1982 5 p ref Presented at the 16th IEEE Photovoltaics Specialists Conf., San Diego, Calif., 28 Sep. 1982
(Contract DE-AC04-76DP-00789)
(DE83-001273; SAND-82-2135C; CONF-820906-21) Avail: NTIS HC A02/MF A01

The performance of 12 intermediate sized photovoltaic power systems are evaluated. The data collection system and the monthly summary reports issued for each system are described. Typical data plots for an example system are presented. DOE

**N83-23895#** Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
**PERFORMANCE AND STABILITY OF THE MIST-LIFT PROCESS FOR OPEN-CYCLE OCEAN THERMAL ENERGY CONVERSION**
Roger Davenport and David Johnson Sep. 1982 15 p refs Presented at the ASME Winter Ann. Meeting, Phoenix, Ariz., 14-19 Nov. 1982
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE83-0000450; SERI/TP-252-1596; CONF-821101-11) Avail: NTIS HC A02/MF A01

The mist lift process for open cycle OTEC was studied. A multiple drop size model that considers collisions and coalescence of drops indicate that drop growth is rapid. An improved model that includes breakup of drops and coalescence indicates that drops tend to grow rapidly to a mean diameter of about 0.5 mm and that collisions prevent the drops from growing much larger than a few millimeters. It is indicated that the mist lift process will perform under a variety of conditions. Considerations for the design of mist lift tube are identified. Results of a transient mist lift model indicate that the mist flow process is stable to perturbations in operating conditions, as long as the conditions remain within the steady state operational envelope for the particular mist lift tube. DOE

**N83-23896#** Lincoln Lab., Mass. Inst. of Tech., Lexington.
**PROTOTYPE RESIDENTIAL PHOTOVOLTAIC SYSTEM: EVALUATION RESULTS**
B. E. Nichols and M. C. Russell 1982 6 p refs Presented at the 16th IEEE PV Spec. Conf., San Diego, Calif., 27-30 Sep. 1982
(Contract DE-AC02-76ET-20279)
(DE83-001139; DOE/ET-20279/230; CONF-820906-12) Avail: NTIS HC A02/MF A01

Residential size photovoltaic power systems were discussed. Lessons learned from this experience, and performance summaries for the five prototype systems at the Northeast Residential Experiment Station and the system at the all electric Carlisle PV house are given. Results of evaluating five utility interactive residential size inverters also are reported. DOE

**N83-23897#** Mississippi State Univ., Mississippi State. Dept. of Forestry.
**GENETIC SELECTION OF AMERICAN SYCAMORE FOR BIOMASS PRODUCTION IN THE MID-SOUTH Final Report, 9 Mar. 1979 - 31 May 1982**
Samuel B. Land, Jr. Sep. 1982 119 p refs
(Contract W-7405-eng-26)
(DE83-00401; ORNL/Sub-81-9051/1) Avail: NTIS HC A06/MF A01

Biomass prediction equations were developed to examine genetic, site, and propagule effects on above stump biomass. Accuracy and precision of subsampling procedures which utilized green weight ratios were high for stem wood and bark, slightly less for limb components, and poorest for the leaf component. The best predictor variables for stem biomass equations were DBH2, (DBH), and (DBH)2, and DBH)2 times height. Crown width, crown surface area, and (DBH)2 times the crown length/tree height ratio were more appropriate predictors for limb of leaf biomass. Specific gravity and moisture content varied within the tree, among sites, and among families within seed sources, but not among sources. Survival, biomass per tree, and biomass per hectare were lowest for trees established from seedling top cuttings, higher for top pruned seedlings, and highest for whole seedlings. Site differences were very large for biomass production, with the best site having nearly as much stem plus limb dry weight per hectare at age five as three other sites combined. Geographic seed sources from south of each planting site produced more biomass per hectare than sources from north of the site. Family differences within sources were significant, as were site-by-family interactions. DOE

**N83-23898#** Pacific Northwest Lab., Richland, Wash.
**STEAM GASIFICATION OF WOOD IN THE PRESENCE OF CATALYSTS**
L. K. Mudge, D. H. Mitchell, E. G. Baker, R. J. Robertus, and M. D. Brown 1982 24 p refs Presented at the 14th Biomass Thermoconversion Contractors' Meeting, Arlington, Va., 23-24 Jun. 1982
(Contract DE-AC06-76RL-01830)
(DE83-002071; PNL-SA-9954-Rev-1; CONF-820685-3-Rev-1) Avail: NTIS HC A02/MF A01

Catalytic steam gasification of wood, including sawdust, chipped forest slash, and mill shavings, is investigated. Results of laboratory, process development unit (PDR), and feasibility studies illustrate attractive processes for conversion of wood to methanol and a substitute natural gas (SNG). Recent laboratory studies developed a long-lived alloy catalyst for generation of a methanol synthesis gas by steam gasification of wood. Modification of the PDU for operation at 10 atm (150 psia) is complete and initial tests are completed. The modified PDU will be operated at elevated pressures to confirm yields and design parameters used in process feasibility studies. A computer program for evaluating the effect of yield changes on process economics was completed. The base case was the study on economics of methanol-from-wood using catalytic gasification. It was found that methanol-from-wood by catalytic gasification was competitive with the process for methanol production from natural gas. DOE

**N83-23899#** Sandia Labs., Albuquerque, N. Mex.
**TEST DATA ANALYSIS AND RESULTS FOR CONCENTRATING PHOTOVOLTAIC MODULES**
M. W. Edenburn, H. J. Gerwin, and C. J. Chiang 1982 6 p refs Presented at the 16th IEEE Photovoltaics Spec. Conf., San Diego, Calif., 28 Sep. 1982
(Contract DE-AC04-76DP-00789)
(DE83-000049; SAND-82-0514C; CONF-820906-20) Avail: NTIS HC A02/MF A01

The efficiency expressed in a linear function of cell temperature and illumination is presented. The expression is used to correlate test data for concentrating photovoltaic modules. The linear form of the equation is justified by showing that it derives from a cell model that considers the cell to be a parallel current source and diode in series with a resistance. The linear expression is used to correlate test results for a variety of concentrating modules. Results for those modules are presented. DOE

**N83-23900#** Sandia Labs., Albuquerque, N. Mex.
**LOW-COST MODULAR ARRAY-FIELD DESIGNS FOR FLAT-PANEL AND CONCENTRATOR PHOTOVOLTAIC SYSTEMS**
H. N. Post, D. C. Carmichael (Battelle-Columbus Labs.), G. Alexander (Battelle-Columbus Labs.), and J. A. Castle (Hughes Aircraft Co.) 1982 6 p refs Presented at the 16th IEEE Photovoltaics Spec. Conf., San Diego, Calif., 28 Sep. 1982
(Contract DE-AC04-76DP-00789)
(DE83-000079; SAND-82-0539C; CONF-820906-13) Avail: NTIS HC A02/MF A01

Described are the design and development of low-cost, modular array fields for flat-panel and concentrator photovoltaic (PV) systems. The objective of the work was to reduce substantially the cost of the array-field Balance-of-System (BOS) subsystems and site-specific design costs as compared to previous PV installations. These subsystems include site preparation, foundations, support structures, electrical writing, grounding, lightning protection, electromagnetic interference considerations, and controls. To reduce these BOS and design costs, standardized modular (building-block) designs for flat-panel and concentrator array fields have been developed that are fully integrated and optimized for lowest life-cycle costs. Using drawings and specifications now available, these building-block designs can be used in multiples to install various size array fields. The developed designs are immediately applicable (1982) and reduce the array-field BOS costs to a fraction of previous costs. DOE

**N83-23901#** Sandia Labs., Albuquerque, N. Mex.
**HYDROGEN PASSIVATION OF POLYCRYSTALLINE SILICON PHOTOVOLTAIC CELLS**
C. H. Seager, D. J. Sharp, J. K. G. Panitz, and J. I. Hanoka (Mobil Tyco Solar Energy Corp., Waltham, Mass.) 1982 26 p refs Presented at Colloq. on Polycrystalline Semiconductors, Perpignan, France, 2 Sep. 1982
(Contract DE-AC04-76DP-00789)
(SAND-82-1031C; DE82-022168; CONF-820961-1) Avail: NTIS HC A03/MF A01

The effect of atomic hydrogen on silicon grain boundaries is reviewed along with recent scanned spot methods for measuring the minority carrier recombination velocity, s, at grain boundaries. Electron beam induced current data on numerous grain boundaries are discussed; it is shown that the differences in barrier height reduction from boundary to boundary in response to hydrogen at the sample surface are due to differences in boundary properties and not to fluctuations in the treatment conditions. The results of applying the Kaufman ion source passivation method to Edge Fed Growth ribbon solar cells indicate that substantial efficiency increases can be achieved in these devices with only a few minutes exposure to the hydrogen ion beam. DOE

**N83-23902#** Sandia Labs., Albuquerque, N. Mex.
**DESIGN AND ECONOMICS OF A PHOTOVOLTAIC CONCENTRATOR ARRAY FOR OFF-GRID APPLICATIONS**
Alexander B. Maish and Miguel Rios, Jr. 1982 6 p refs Presented at the 16th IEEE Photovoltaics Spec. Conf., San Diego, Calif., 28 Sep. 1982
(Contract DE-AC04-76DP-00789)
(DE83-000318; SAND-82-2162C; CONF-820906-19) Avail: NTIS HC A02/MF A01

The array design and expected operation of a photovoltaic concentrator are discussed. A second generation stand alone 680 W/sub p/ photovoltaic (PV) concentrating array for low power, nongrid connected applications was designed. The array consists of six passive cooled point focus Fresnel lens concentrating modules on a two axis polar mount tracking structure. The new array design incorporates several major improvements to the first generation design. These include 50% more array area and a control system which allows unattended, fully automatic operation. The life cycle energy costs are calculated and compared to the equivalent energy costs of a 3 kW diesel electric generator set and an equivalent flat panel PV system. DOE

**N83-23903#** Sandia Labs., Albuquerque, N. Mex.
**SOME ADVANCED TESTING TECHNIQUES FOR CONCENTRATOR PHOTOVOLTAIC CELLS AND LENSES**
J. J. Wiczer, R. J. Chaffin, and R. E. Hibray 1982 19 p refs Presented at 16th IEEE Photovoltaics Specialists Conf., San Diego, Calif., 28 Sep. 1982
(Contract DE-AC04-76DP-00789)
(DE83-000321; SAND-82-2218C; CONF-820906-18) Avail: NTIS HC A02/MF A01

Two separate test techniques for evaluating concentrator photovoltaic components are described. A method was developed for measuring the entire illuminated I-V curve of a photovoltaic cell with a single flash of intense simulated sunlight. This method reduces the heat input to the cell and the time required to test a cell, allowing quick, indoor measurements of photovoltaic conversion efficiency at concentrated illumination levels. The other test method provides a technique to analyze the spatially dependent, spectral distribution of intense sunlight collected and focused by lenses designed for use in photovoltaic concentrator systems. The information is important in the design of multijunction photovoltaic receivers, secondary concentrators, and in optimizing the performance of conventional silicon cell concentrator systems. DOE

**N83-23904#** Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
**RESEARCH ON POLYCRYSTALLINE-SILICON SOLAR CELLS: GOALS AND ACCOMPLISHMENTS**
J. B. Milstein, R. W. Hardy, and Y. S. Tsuo Sep. 1982 6 p refs Presented at 16th IEEE Photovoltaics Specialists Conf., San Diego, Calif., 28 Sep. 1982
(Contract DE-AC02-77CH-00178)
(DE83-002093; SERI/TP-211-1747; CONF-820906-22) Avail: NTIS HC A02/MF A01

The results obtained in the polycrystalline silicon solar cell task area at the Solar Energy Research Institute (SERI) since the last IEEE photovoltaic Specialists Conference are given. A description of the goals which are expected to be achieved in the next year and beyond are given. Some of the future program elements are presented in general terms, in view of requests for proposals that are presently in process. Ribbon quality, cell efficiency, electrical properties, and defects are discussed. DOE

**N83-23905#** Grace (W. R.) and Co., Memphis, Tenn. Agricultural Chemicals Group.
**TECHNICAL SUPPORT REPORT: PRELIMINARY DESIGN AND ASSESSMENT OF A 50,000 BPD COAL-TO-METHANOL-TO-GASOLINE PLANT**
28 Apr. 1983 45 p refs
(Contract DE-FC02-80ET-14759)
(DE83-000904; DOE/ET-14759/T7-36) Avail: NTIS HC A03/MF A01

The technical support provided from process licensors, equipment suppliers, and consultants for use in the preliminary design of a coal-to-methanol-to-gasoline plant is discussed. Prime consideration was given to the selection of processes and equipment that was proven commercially. Support was given for

pollution control, desulfurizing, water treatment, and environment effects. DOE

**N83-23906#** Sandia Labs., Albuquerque, N. Mex.
**RESIDENTIAL PHOTOVOLTAIC SYSTEMS: RESULTS AND ISSUES**
G. J. Jones and K. L. Biringer 1982 4 p refs Presented at 16th IEEE Photovoltaics Specialists Conf., San Diego, Calif., 28 Sep. 1982
(Contract DE-AC04-76DP-00789)
(DE83-001032; SAND-82-2219C; CONF-820906-9) Avail: NTIS HC A02/MF A01

If the photovoltaic system in a residential application is viewed as dedicated to the household loads, the on site energy use becomes the key factor in system design. However, the basis for this viewpoint is that the backup electricity cost to the homeowner is independent of the PV system's presence. If a PV system reflects long term utility action, then the value of PV generated energy must be based on utility avoided cost independent of the point of energy use. This perspective is discussed and it is shown how it leads to a realization that residential system designs are independent of on site load and direct use fraction. DOE

**N83-23907#** Sandia Labs., Albuquerque, N. Mex.
**FUTURE CONTINGENCIES AND PHOTOVOLTAIC SYSTEM WORTH**
Gary J. Jones, Michael G. Thomas, and Gary J. Bonk (General Electric Co., Schenectady, N.Y.) 1982 6 p refs Presented at the 16th IEEE Photovoltaics Specialists Conf., San Diego, Calif., 28 Sep. 1982
(Contract DE-AC04-76DP-00789)
(DE83-001033; SAND-82-2220C; CONF-820906-8) Avail: NTIS HC A02/MF A01

The value of dispersed photovoltaic systems connected to the utility grid was calculated using the optimized generation planning program. The 1986 to 2001 time period was used for this study. Photovoltaic systems were dynamically integrated, up to 5% total capacity, into 9 NERC based regions under a range of future fuel and economic contingencies. Value was determined by the change in revenue requirements due to the photovoltaic additions. Displacement of high cost fuel was paramount to value, while capacity displacement was highly variable and dependent upon regional fuel mix. DOE

**N83-23908#** Lincoln Lab., Mass. Inst. of Tech., Lexington.
**REDUCTION OF PHOTOVOLTAIC CELL REVERSE BREAKDOWN BY A PERIPHERAL BYPASS DIODE**
C. H. Cox, III, D. J. Silversmith, and R. W. Mountain 1982 6 p refs Presented at the 16th IEEE Photovoltaic Specialists Conf., San Diego, Calif., 28 Sep. 1982
(Contract DE-AC02-76ET-20279)
(DE83-001137; DOE/ET-20279/228; CONF-820906-6) Avail: NTIS HC A02/MF A01

A photovoltaic cell in a series connected string can be forced to operate in a power dissipation mode when the cell's short circuit current is reduced below the string current as a result of cracking or shadowing. New techniques for significantly reducing the power dissipated are reported based on locating protection for the cell around its periphery. One approach uses a standard diode, thereby requiring processing; the other approach uses a backward diode, which requires one additional doping step. A power dissipation reduction of more than a factor of 10 with the backward diode and over 30 for the standard diode. It is found that the standard diode requires a slight increase in cell interconnect complexity while the backward diodes uses conventional interconnection. DOE

**N83-23909#** Lincoln Lab., Mass. Inst. of Tech., Lexington.
**SWEPT MEASUREMENT OF HIGH-POWER I-V CURVES**
C. H. Cox, III and T. H. Warner 1982 7 p refs Presented at the 16th IEEE Photovoltaic Specialists Conf., San Diego, Calif., 28 Sep. 1982
(Contract DE-AC02-76ET-20279)
(DE83-001138; DOE/ET-20279/229; CONF-820906-7) Avail: NTIS HC A02/MF A01

Performance evaluation of photovoltaic (PV) arrays under a variety of conditions provides important information for the design and maintenance of PV systems. One of the principal methods for assessing an array's performance is to plot its current, I, versus voltage V, curve techniques for measuring the I-V curve were evaluated a new capacity based approach is presented. It uses a rapid sweep of the I-V curve which substantially reduces the average power transfer between array and load, and in turn, substantially reduces the size and weight of the curve tracer. Performance is verified by comparison with I-V curves obtained by using a conventional load. Approximately an order of magnitude reduction in size, weight and power consumption over conventional units was realized with the experimental I-V curve tracer. DOE

**N83-23910#** Sun Belt Energy Corp., Sardis, Miss.
**FEASIBILITY STUDY OF A CORN-TO-ETHANOL PLANT IN SARDIS, MISSISSIPPI**
Jun. 1982 138 p refs Prepared in cooperation with Resource Planning Associates, Inc., Cambridge, Mass. and Bechtel Petroleum, Inc., Louisville, Ky.
(Contract DE-FG07-81ID-12277)
(DE83-000805; DOE/ID-12277/T1-Vol-1) Avail: NTIS HC A07/MF A01

A feasibility study for a corn to ethanol plant in Panola County, Mississippi was carried out. This area is well suited for the production of ethanol from corn, as it has a mild climate, a plentiful supply of wood fuel, and a well developed agricultural infrastructure. The project was designed for 5 million gallons per year, using the ACR Process, a process proven in 6 plants now operating. It was determined to be technically feasible for this size. However, without a state financial incentive such as a gasoline excise tax or sales tax exemption, the plant is not economically feasible in Mississippi. Even though a 4 cents per gallon federal excise tax exemption will likely remain, the economics without any other incentive are not strong enough to obtain financing or equity funds. While the Mississippi legislature decided not to consider a financial incentive in their 1982 session, an attempt will be made to introduce a proposal for a suitable exemption during the 1983 legislative session. Until then, the project is on hold. DOE

**N83-23911#** Sun Belt Energy Corp., Sardis, Miss.
**FEASIBILITY STUDY OF A CORN-TO-ETHANOL PLANT IN SARDIS, MISSISSIPPI, VOLUME 2**
Jun. 1982 117 p Prepared in cooperation with Resource Planning Associates, Inc. and Bechtel Petroleum, Inc.
(Contract FG07-81ID-12277)
(DE83-000806; DOE/ID-12277/T1-Vol-2) Avail: NTIS HC A06/MF A01

A technical description of a chemical processing facility capable of producing 5 million gallons per year of denatured anhydrous ethanol (power alcohol) is presented. In addition, certain equipment options are evaluated on the basis of availability, reliability, and budget constraints. Analysis of logistics and sensitivity of financial decision making criteria to market variables is not within the scope of this study. Consequently, concluding statements are limited to a discussion of technical feasibility and a statement of capital cost for turn key construction. DOE

**N83-23912#** Process Plants, Inc., Houston, Tex.
**REPORT ON THE ENGINEERING AND ECONOMICS OF AN ETHANOL/GASOHOL JOINT-VENTURE PROJECT WITH CALDWELL SUGARS CO-OP, INC. AT THIBODAUX, LOUISIANA. ATTACHMENT A. VOLUME 1: DEFINITION OF FACILITIES AND SCOPE OF WORK FOR AN ETHANOL FACILITY TO BE LOCATED AT THIBODAUX, LOUISIANA**
Apr. 1982 304 p Prepared in cooperation with Tate and Lyle Technical Services, Inc.
(Contract DE-FG07-81RA-50338)
(DE83-001166; DOE/RA-50338/1-Vol-1-Attach-A) Avail: NTIS

HC A14/MF A01

A Lump Sum Proposal for engineering, procurement, and construction service for the ethanol plant is presented. The scope of work and process description are covered. The process description includes the process flow diagrams, equipment list, and piping and instrument diagrams. DOE

**N83-23913#** Institute of Gas Technology, Chicago, Ill.
**SINGLE-STAGE FLUIDIZED-BED GASIFICATION**
F. S. Lau, D. M. Rue, S. A. Weil, and D. V. Punwani Apr. 1982 13 p refs Presented at 5th Tech. Conf. on Peat, Bethesda, Md., 27 Apr. 1982
(DE83-900127; CONF-820453-3) Avail: NTIS HC A02/MF A01

The single-stage fluidized-bed gasification process, in addition to being a simple system, maximizes gas production and allows the economic exploitation of small peat deposits. The objective of this gasification project is to conduct experiments in order to obtain data for designing a single-stage fluidized-bed gasifier, and to evaluate the economics of converting peat to synthesis gas and to SNG by this process. An existing high-temperature and high-pressure process development unit (PDU) was modified to permit the direct feeding of peat to the fluidized bed. Peat flows by gravity from the feed hopper through a 6-inch line to the screw-feeder conveyor. From there, it is fed to the bottom tee section of the reactor and transported into the gasification zone. Oxygen and steam are fed through a distributing ring into the reactor. Gasification reactions occur in the annulus formed by the reactor tube and a central standpipe. Peat ash is discharged from the reactor by overflowing into the standpipe and is collected in a solids receiver. DOE

**N83-23914#** Institute of Gas Technology, Chicago, Ill.
**MEDIUM-Btu GAS FROM COAL BY THE IGT U-GAS PROCESS**
A. Rehmat, M. K. Vora, and B. G. Bryan 1982 16 p refs Presented at Am. Inst. of Chem. Engr. Spring Meeting, Anaheim, Calif., 8 Jun. 1982
(DE82-022185; CONF-820610-12) Avail: NTIS HC A02/MF A01

The Institute of Gas Technology's (IGT) U-GAS process for medium-Btu fuel gas offers a means to produce a clean fuel from coal with minimal environmental impact. The U-GAS process uses an ash agglomeration mechanism in a single-stage fluidized bed coal gasifier to achieve high coal conversions. The U-GAS pilot plant has been operated since 1974 in support of the U-GAS process development. During this time, several types of coal and char have been successfully gasified with coal conversion efficiencies as high as 98.5%. In over 10,000 hours of total operation, 123 pilot plant tests have been completed with 1859 tons (1693 Mg) of coals gasified. Steady-state operations at pressures up to 60 psia (413 kPa) and temperatures up to 2000 F (1093 C) have produced a good quality fuel gas with a heating value as high as 284 Btu/SCF (10,579kJ/cu m). Through this extensive testing and development program, the U-GAS process feasibility has been firmly established and an extensive data base acquired for scale-up. DOE

**N83-23915#** California Univ., Livermore. Lawrence Livermore Lab.
**ENERGY AND TECHNOLOGY REVIEW**
Irving F. Stowers Sep. 1982 44 p
(Contract W-7405-eng-48)
(DE83-000340; UCRL-52000-82-9) Avail: NTIS HC A03/MF A01

The early history of the Lawrence Livermore national laboratory is reviewed, including: the LLNL-Nevada organization; project Plowshare; the chemistry and materials science department; and development of computer systems. DOE

**N83-23916#** California Univ., Livermore. Lawrence Livermore Lab. Fusion/Synfuels Program.
**ANALYTICAL STUDY OF LIQUID METAL HEAT PIPES IN A MAGNETIC FIELD M.S. Thesis**
Nancy Schwertz 25 Aug. 1982 110 p refs
(Contract W-7405-eng-48)
(DE83-002091; UCID-19540) Avail: NTIS HC A06/MF A01

The use of liquid metal heat pipes in a magnetic field was investigated. This was accomplished in two steps. A set of modified heat pipe equations to predict the heat transfer capability of a liquid metal heat pipe for the following special conditions was developed: operation in a magnetic field; nonuniform heating of the evaporator; and variable area adiabatic section. These equations were used in a computer code to model the thermal hydraulic performance of a liquid metal heat pupe for a specific design example. DOE

**N83-23917#** Pacific Northwest Lab., Richland, Wash.
**EVALUATION OF THERMAL-ENERGY STORAGE MEDIA FOR ADVANCED COMPRESSED-AIR ENERGY-STORAGE SYSTEMS**
F. R. Zaloudek, K. R. Wheeler, and L. Marksberry (FluiDyne Engineering Corp., Minneapolis, Minn.) 1982 8 p refs Presented at the AIAA/EPRI Intern. Conf. on UPH and Compressed Air Energy Storage, San Francisco, 21 Sep. 1982 Prepared in cooperation with EPRI
(Contract DE-AC06-76RL-01830)
(DE83-002058; PNL-SA-10531; CONF-820969-1) Avail: NTIS HC A02/MF A01

Proposed designs of adiabatic and hybrid compressed air energy storage (CAES) plants have utilized sensible heat storage systems to store the heat developed during the air compression phase of the operation cycle for subsequent use during the power generation phase. The performance and durability of several heat storage materials proposed for these systems were evaluated. Materials considered were: (1) 3/8 in. sintered iron oxide pellets; (2) 1/2-in. Denstone spheres; (3) 1 in. cast iron alloy balls; and (4) crushed rock. The results indicated that, from the standpoint of performance and durability, Denstone, cast iron containing 27% or more chromium, or crushed rock (Dresser basalt) would be satisfactory. However, considering material costs in addition to performance and durability, crushed rock would probably be the most desirable heat storage material for these types of CAES plants. DOE

**N83-23918#** Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
**DIFFUSION LENGTH AND COLLECTION WIDTH FOR THE EVALUATION OF A-Si**
Thomas J. McMahon and Rolf Konenkamp (Tulane Univ.) Sep. 1982 10 p refs Presented at the 16th IEEE Photovoltaics Specialists Conf., San Diego, Calif., 28 Sep. - 1 Oct. 1982
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE83-000121; SERI/TP-212-1738; CONF-80906-5) Avail: NTIS HC A02/MF A01

The surface photovoltage technique is applied by using the liquid Schottky contact to a variety of glow discharge a-Si:H films to measure collection width, diffusion length and depletion width. These measures are sensitive method for studying light soak changes. The density of states at the Fermi level were estimated. DOE

**N83-23919#** Lincoln Lab., Mass. Inst. of Tech., Lexington.
**EFFECT OF OPERATING-POINT-CONTROL STRATEGY ON THE ANNUAL ENERGY PRODUCTION OF DEGRADED PHOTOVOLTAIC ARRAYS**
H. M. Branz 1982 7 p refs Presented at the 16th IEEE Photovoltaic Specialists Conf., San Diego, Calif., 27-30 Sep. 1982
(Contract DE-AC02-76ET-20279)
(DE83-001135; DOE/ET-20279/226; CONF-820906-11) Avail: NTIS HC A02/MF A01

A new computer simulation of the annual operation of degraded flat-plate photovoltaic (PV) arrays is used to evaluate the need for maximum-power-point tracking in real PV systems. The simulations are based on single-glitch I-V curve shapes rather than particular array degradations, making the data reported applicable to any system whose likely failure modes are predictable and result in single-glitch I-V curves. The simulations show that with a reasonable array wiring strategy, effective maintenance, periodic I-V curve tracing, and avoidance of frequent and serious array shadowing, there is no reason that considerations of

degradation should force the adoption of maximum-power-point-tracking power conditioning on a PV system that would otherwise operate economically at fixed voltage. DOE

**N83-23920#** Sandia Labs., Albuquerque, N. Mex. Solar Research and Evaluation Div.

**MICROPROCESSOR-CONTROLLED SUNTRACKER AND LOAD CONTROLLER FOR PHOTOVOLTAIC CONCENTRATOR ARRAY POWER SYSTEMS**

Daniel A. Pritchard 1982 9 p refs Presented at the 16th IEEE Photovoltaics Specialists Conf., San Diego, Calif., 28 Sep. 1982
(Contract DE-AC04-76DP-00789)
(DE82-022163; SAND-82-2119C; CONF-820906-4) Avail: NTIS HC A02/MF A01

The design, development, and evaluation of a microcomputer based solar tracking and control system (TACS) for a photovoltaic (PV) concentrator array are described. The TACS combines the function of Sun tracking with the function of load adjustment for peak array efficiency. The complete PV array is used as the Sun sensor. The TACS minimizes tracking errors caused by dust and dirt on shadow band tracking systems, and minimizes the effects of structural warpage and sag that may occur in large arrays. A single board computer with a specially designed input/output board controls array positioning by an orderly method of stepped movements and finds the peak power point by scanning the current-voltage curve of the array. A deviation in maximum power of less than 1% during the day is shown. DOE

**N83-23921#** California Univ., Berkeley. Lawrence Berkeley Lab. Energy and Environment Div.

**MONITORED LOW-ENERGY HOUSES IN NORTH AMERICA AND EUROPE: A COMPILATION AND ECONOMIC ANALYSIS**

Jesse C. Ribot and Arthur H. Rosenfeld Aug. 1982 21 p refs Presented at the 2nd ACEEE Conf. on Energy Efficient Buildings, Santa Cruz, Calif., 22 Aug. 1982
(Contract DE-AC03-76SF-00098)
(DE82-021789; LBL-14788; CONF-820849-8) Avail: NTIS HC A02/MF A01

In a continuing compilation, 128 submetered, energy efficient homes in North America and Europe were analyzed. Only 59 have acceptable data on additional first cost of conservation measures. Of these, the lowest cost of conserved energy is for the superinsulated category, where the cost of conserved energy is well under the average price of electricity, i.e., 6.2 cents per kWh. Only 37 homes have submetering adequate to permit correcting space heating loads for variations in occupant behavior (thermostat setting and internal gains). For these 37, the mean standardized thermal integrity is 50.3 kJ per sq meter DD, compared to US 1979 building practice of 100, or US stock of 180. DOE

**N83-23922#** Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.

**TRUSCOTT BRINE LAKE SOLAR-POND SYSTEM CONCEPTUAL DESIGN**

Cecile M. Leboeuf and E. Kenneth May Aug. 1982 7 p refs Presented at the ASME Winter Ann. Meeting, Phoenix, Ariz., 16-19 Nov. 1982
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE82-020923; SERI/TP-253-1667; CONF-821101-10) Avail: NTIS HC A02/MF A01

Discussed is a conceptual design study for a system of electricity-producing salt-gradient solar ponds that will provide power to a chloride control project under construction near Truscott, Tex. The chloride control project comprises a 1200-ha (3000-acre) brine impoundment lake to which brine will be pumped from several salty sources in the Wichita River basin. The solar ponds are formed by natural evaporation of the briny water pumped to Truscott. Heat is extraced from the solar ponds and used to drive organic Rankine-cycle generators. Ponds were sized to provide the pumping needs of the chloride control project and the maintenance requirements of the solar ponds. The system includes six solar pond modules for a total area of 63.1 ha, and produces 1290 kW of base load electricity. Although sized for continuous power production, alternative operating scenarios involving production of peak power for shorter durations were also examined. DOE

**N83-23923#** Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.

**PROGRESS IN POLYCRYSTALLINE THIN-FILM PHOTOVOLTAIC-DEVICE RESEARCH**

Allen M. Hermann, Leon Fabick, Kenneth Zweibel, and Rodger W. Hardy Sep. 1982 8 p refs Presented at the 16th IEEE Photovoltaics Spec. Conf., San Diego, Calif., 27-30 Sep. 1982
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE83-001232; SERI/TP-211-1716; CONF-820906-15) Avail: NTIS HC A02/MF A01

Recent results from the United States Department of Energy (DOE) Thin Film Photovoltaic Device Program are presented. The program encompasses materials and device research on highly absorbing compound semiconductors including CuInSe2, CdTe, Cu/sub 2-x/Se, Zn3P2, ZnSiAs2, and Cu2S. Excitement in the program has been generated by recent progress in the (Cd,Zn)S/CuInSe2 device area where an efficiency of 10.6% on a 5 micrometers thick device has been reported. Other highlights include deposition of a hybrid CdS/Cu2S device (evaporated CdS, sputtered Cu2S) with a 7.1% AMI efficiency, and of a 3.94% AMI efficiency all sputtered CdS/Cu2S cell. AMI efficiencies exceeding 5% are reported for CdTe Schottky barrier and heterojunction devices, and for a CdS/Cu/sub 2-x/Se heterojunction. AMI efficiencies exceeding 4% are reported for Mg/Zn3P3 Schottky barrier cells. Future research emphasis is outlined. DOE

**N83-23924#** Alaska Univ., Fairbanks. Geophysical Inst.

**PRELIMINARY GEOTHERMAL INVESTIGATIONS AT MANLEY HOT SPRINGS, ALASKA**

Jennifer East, Eugene Wescott, and Donald L. Turner Apr. 1982 85 p refs
(Contract DE-FC07-79ET-27034)
(DE82-020604; DOE/ET-27034/T1; UAG-R-290) Avail: NTIS HC A05/MF A01

Shallow, thermally disturbed ground at Manley Hot Springs constitutes an area of 1.2 km by 0.6 km along the lower slopes of Bean Ridge on the north side of the Tanana Valley. This area includes 32 springs and seeps and one warm (29.1 C) well. The hottest springs range in temperature from 61 to 47 C and are presently utilized for space heating and irrigation. The goal was to characterize the geothermal system present at Manley Hot Springs and delineate likely sites for geothermal drilling. Several surveys were conducted over a grid system which included shallow ground temperature, helium soil gas, mercury soil and resistivity surveys. In addition, a reconnaissance ground temperature survey and water chemistry sampling program was undertaken. The preliminary results, including some preliminary water chemistry, show that shallow hydrothermal activity can be delineated by many of the surveys. Three localities are targeted as likely geothermal well sites, and a model is proposed for the geothermal system at Manley Hot Springs. DOE

**N83-23925#** Arizona Bureau of Geology and Mineral Technology, Tucson. Geothermal Group.

**PRELIMINARY ASSESSMENT OF THE GEOTHERMAL RESOURCE POTENTIAL OF THE YUMA AREA, ARIZONA**

Claudia Stone 1981 27 p refs
(Contract DE-FC07-79ID-12009)
(DE82-021571; DOE/ID-12009/T3) Avail: NTIS HC A03/MF A01

The geothermal resource potential of the Yuma area of Arizona is discussed. The area is made up of low, rugged northwest trending mountains separated by deep sediment filled basins. Northwest trending en-echelon faults bound the range fronts and the basins, and created several horst blocks (basement highs) that crop out at or near the surface. The Algodonnes fault is inferred to represent the northeast margin of the Salton Trough and apparently an inactive extension of the San Andreas fault system. Extensive well pumping and applications of irrigation waters in recent years have created an unnatural state of flux in the hydrologic regime

in the Yuma area. Electrical resistivity values in the Bouse Formation are exceptionally low, about 3 ohm-m. Heat flow appears to be normal for the Basin and Range province. Ground water temperatures indicate zones of rising warm water, with one such warm anomaly confirmed by sparse geothermal gradient data. DOE

**N83-23926#** White Earth Indian Reservation, Minn.
**CATTAIL-TO-ALCOHOL PROJECT Final Technical Report**
1982 9 p refs
(Contract DE-FG02-80R5-10239)
(DE82-021053; DOE/R5-10239/1) Avail: NTIS HC A02/MF A01

Harvesting, grinding, and fermentation of cattails and/or their rhizomes are described. The use of antibiotics to prevent massive contamination of microorganisms and cessation of fermentation is discussed. DOE

**N83-23927#** Helionetics, Inc., San Diego, Calif.
**IMPROVED BEAM PROCESSING FOR TERRESTRIAL SOLAR CELLS**
R. T. Young, G. A. VanderLeeden, R. D. Westbrook, R. L. Sandstrom, and J. I. Levatter 1982 2 p refs Presented at the 16th IEEE Photovoltaics Spec. Conf., San Diego, Calif., 28 Sep. 1982 Prepared in cooperation with ORNL
(Contract W-7405-eng-26)
(DE82-022337; CONF-820906-3) Avail: NTIS HC A02/MF A01

The major difficulties at present in using laser beam processing for terrestrial solar cells are: (1) lack of a suitable laser for large volume cell production; and (2) expense and low throughput of conventional ion implantation, especially for the low energy implantation needed to obtain shallow p-n junctions. It is shown that these problems may be solved by simple glow discharge implantation equipment and an XeCl excimer laser for annealing. It is indicated that with this combination, p+n Si solar cells with efficiencies of 15% AM1 can be readily obtained without any back surface field. It is shown that the front surface metal coverage of the cells can be reduced to approximately 5% while retaining very good fill factors. The blue response of the cells is extremely good. DOE

**N83-23928#** Arizona Bureau of Geology and Mineral Technology, Tucson. Geothermal Group.
**GEOTHERMAL-RESOURCE POTENTIAL FOR A PORTION OF THE SAN PEDRO RIVER VALLEY**
W. Richard Hahman, Sr. 1981 60 p refs
(Contract DE-FC07-79ID-12009)
(DE82-021852; DOE/ID-12009/T2) Avail: NTIS HC A04/MF A01

Three anomalous areas containing shallow-depth warm water were located in the San Pedro study area: the San Manuel-Mammoth area; the A.C. Gruwell Ranch; and Hookers Hot Springs at the Muleshoe Ranch. The probable explanation for these warm water resources is as follows. The Galiuro Mountains, the remains of a volcanic pile deposited along the axis of a large synform are in all probability an area of recharge for the ground water system in the area. The meteoric water falling down upon the Galiuro Mountains percolates downward to great depths through fractures in the volcanic rocks, becomes heated, rises by convection along faults, encounters later Tertiary sedimentary units overlying these faults and migrates laterally through these sediments out into the basin. These warm waters are now near the surface because of erosion of the late Tertiary and Quaternary sedimentary units by the San Pedro River. DOE

**N83-23929#** Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
**THE SERI SOLAR-ENERGY-STORAGE PROGRAM IN FY 1982**
W. Luft Jul. 1982 6 p refs Presented at Energy Storage Contractors Rev. Meeting, Arlington, Va., 23 Aug. 1982
(Contract DE-AC02-77CH-00178)
(DE82-018306; SERI/TP-231-1660; CONF-820827-2) Avail: NTIS HC A02/MF A01

The SERI solar energy storage program in FY 1982 is summarized against the background of earlier years and the broader program of energy storage technology. The program provides research, system analyses, and assessments of thermal and thermochemical storage and transport, for thermal energy storage for solar thermal applications (TESSTA). Current activities include recommendations for the development of promising storage concepts for specified solar thermal power and process heat systems in house and subcontracted explorations of advanced concepts, and assessments of long distance solar thermal energy transport concepts. DOE

**N83-23930#** Budd Co., Fort Washington, Pa. Advanced Materials Research Dept.
**DEVELOPMENT EFFORT ON SHEET-MOLDING COMPOUND (SMC) PARABOLIC-TROUGH PANELS**
Paul A. Kirsch Jul. 1982 103 p refs
(Contract DE-AC04-76DP-00789)
(DE83-000392; SAND-81-7037) Avail: NTIS HC A06/MF A01

The approach taken to develop integrally molded reflective glass with sheet molding compound into parabolic trough solar reflectors is described in detail. Results indicate that mirrored glass sheets, if properly strengthened to withstand the temperature and pressure of the molding process, can be successfully molded with sheet molding compound in a single press stroke using standard compression molding techniques. The silver reflective surface must be coated with an adhesive mixture that provides both protection of the silver and adhesion to the sheet molding compound. The sheet molding compound must provide the strength and stiffness required of a structure backing material. DOE

**N83-23931#** Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
**MEASURED PASSIVE-SOLAR PERFORMANCE FROM NEW RESIDENCES IN DENVER, COLORADO**
J. N. Swisher Aug. 1982 23 p refs Presented at Summer Study in Energy Efficiency Buildings, Santa Cruz, 22 Aug. 1982
(Contract DE-AC02-77CH-00178)
(DE82-022076; SERI/TP-254-1682; CONF-820849-6) Avail: NTIS HC A02/MF A01

Discussed is the thermal performance of twelve passive solar residences in the Denver, Colorado, metropolitan area. These buildings were monitored during the 1981 to 1982 heating season as part of the Residential Class B Passive Solar Performance Monitoring Program. A low-cost approach to building thermal monitoring is explained, including the instrumentation hardware, the real-time data reduction program, and the performance evaluation methodology. The buildings are described in detail, with monthly and seasonal summaries of weather data and the basic building energy flows. Future detailed analysis efforts, using hourly data, are discussed briefly. DOE

**N83-23932#** Energy Systems Group, Inc., Atlanta, Ga.
**ANALYSIS OF SELECTED PHOTOVOLTAIC SYSTEMS AND STORAGE OPTIONS FOR RESIDENTIAL APPLICATIONS IN HOT, HUMID CLIMATES**
Andrew S. Lau, John M. Hill, and David E. Ball Aug. 1982 89 p refs
(Contract DE-AC02-82CH-10122)
(DE82-020531; DOE/CH-10122/3) Avail: NTIS HC A05/MF A01

The relationship is studied between photovoltaic (PV) generated power and its on-site use as a function of total array size for an energy-efficient house in the hot, humid climates of Miami and Houston. Options in addition to be the full-roof system using a direct current (dc) to alternating current (ac) inverter are studied in an effort to identify applications which are less expensive and which rely less on utility sellback. The results show that common residential loads in this climate lead to high on-site utilization. For the various PV applications studied, array sizes are identified which can be fully potential is identified both in the house structure and the domestic water heater. Using projected 1986 costs, the economics of selected systems were studied for Miami. Only one

of the system sizes was found to be marginally competitive with utility supplied power. DOE

**N83-23933#** Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
**EVALUATION OF MATERIALS FOR SYSTEMS USING COOLED, TREATED GEOTHERMAL OR HIGH-SALINE BRINES**
Dan F. Suciu and Penny M. Wikoff Sep. 1982 55 p refs
(Contract DE-AC07-76ID-01570)
(DE83-000653; EGG-2213) Avail: NTIS HC A04/MF A01

Lack of adequate quantities of clean surface water for use in wet (evaporative) cooling systems indicates the use of high-salinity waste waters, or cooled geothermal brines, for makeup purposes. High-chloride, aerated water represents an extremely corrosive environment. In order to determine metals suitable for use in such an environment, metal coupons were exposed to aerated, treated geothermal brine salted to a chloride concentration of 10,000 and 50,000 ppM (mg/L) for periods of up to 30 days. The exposed coupons were evaluated to determine the general, pitting, and crevice corrosion characteristics of the metals. Results indicate that ferritic stainless steels (29-4-2 and SEACURE) exhibit excellent corrosion resistance at all levels of chloride concentration. Copper-nickel alloys (70/30 and Monel 400) exhibited excellent corrosion resistance in the high-saline water. The 70/30 copper-nickel alloy, which showed excellent resistance to general corrosion, exhibited mild pitting in the 30-day tests. DOE

**N83-23934#** Brookhaven National Lab., Upton, N. Y.
**CATHODIC PROTECTION IN HIGHLY-AGGRESSIVE GEOTHERMAL ENVIRONMENTS**
R. Bandy and D. vanRooyen 1982 28 p refs Presented at Intern. Conf. on Geothermal Energy, Florence, 11 May 1982
(Contract DE-AC02-76CH-00016)
(DE82-021561; BNL-31737; CONF-820506-6) Avail: NTIS HC A03/MF A01

The feasibility of cathodic protection in highly aggressive geothermal environments were investigated using both impressed current and sacrificial anode techniques. Artificial brines simulating the hypersaline geothermal brines and less aggressive geothermal fluids were used as test environments. Impressed current tests on carbon steel were conducted under controlled potential, and cathodic protection of carbon steel using zinc sacrificial anodes was studied by monitoring the galvanic current and potential of the couple with a zero resistance ammeter. Weight loss measurements were conducted in all cases to determine the amount of protection achieved. Results show that the weight loss generally follows a semilogarthmic relationship with the amount of potential shift away from the corrosion potential as a result of the impressed current. Under cathodic conditions, electrocrystallization was observed on the carbon steel surface, resulting in a small weight gain. For the carbon steel zinc couple, the potential gradually drifts towards that of the open circuit potential of zinc, resulting in protection for the steel and a relatively tolerable corrosion rate for zinc. DOE

**N83-23935#** California Univ., Livermore. Lawrence Livermore Lab.
**GEOTHERMAL INJECTION MONITORING PROJECT, PHASE 1 Status Report, Apr. 1981 - Apr. 1982**
L. Younker, J. Hanson, E. Didwall, P. Kasameyer, A. Smith, J. Hearst, W. Daley, N. Crown, J. Younker, and W. Murray 13 Aug. 1982 154 p refs
(Contract W-7405-eng-48)
(DE82-021949; UCID-19497) Avail: NTIS HC A08/MF A01

The feasibility of using remote geophysical techniques to monitor the movement of injected brine has been evaluated. It was established that no single approach is likely to be identified that can be used to accurately monitor the precise location of the injected fluid. Several approaches have been considered in parallel because they add new dimensions to the existing monitoring capabilities, and are likely to cover a range of applications at a variety of geothermal sites. These include: microseismicity - a seismic net is used to record small magnitude events associated with injection; streaming potential - self potential anomalies produced by a moving fluid identify fluid flow direction; cross borehole geotomography - two dimensional image of flow pathways is constructed using electromagnetic waves; and well pressure response to solid earth tide - changes in pore pressures are used to discriminate fracture/pore porosity and estimate fracture orientations. DOE

**N83-23936#** Allen (Eliot) and Associates, Inc., Salem, Oreg.
**INSTITUTIONAL AND FINANCIAL GUIDE TO GEOTHERMAL DISTRICT HEATING, SERIAL NO. 2**
Mar. 1982 29 p refs
(Contract DE-FG51-79RO-00079)
(DE82-020567; WAOENG-82-03) Avail: NTIS HC A03/MF A01

General planning considerations which affect nearly every community are reviewed, and alternative operating structures which are available to communities are reviewed, including local governments, nonprofit cooperatives, private enterprises, and joint ventures. The financing options available to publicly-owned and privately-owned district heating systems are then summarized. The geothermal production and distribution activities most appropriate to each type of operating structure are reviewed, along with typical equity and debt funding sources. The tax advantages for private developers are described, as are the issues of customer contracts and service prices, and customer retrofit financing. The treatment is limited to an introductory overview. DOE

**N83-23937#** California Univ., Livermore. Lawrence Livermore Lab. Earth Sciences Div.
**IDENTIFICATION OF FLUID-FLOW PATHS IN THE CERRO PRIETO GEOTHERMAL FIELD**
Susan E. Halfman, Marcelo J. Lippmann, Ruben Zelwer, and John H. Howard May 1982 4 p refs Presented at the Geothermal Resources Council Ann. Meeting, San Diego, Calif., 11-14 Oct. 1982
(Contract W-7405-eng-48)
(DE82-018619; LBL-14534; CONF-821007-12) Avail: NTIS HC A02/MF A01

A hydrogeologic model of the Cerro Prieto geothermal field has been developed based on geophysical and lithologic well logs, downhole temperature, and well completion data from about 90 deep wells. The hot brines seem to originate in the eastern part of the field, flowing in a westward direction and rising through gaps in the shaly layers which otherwise act as partial caprocks to the geothermal resource. DOE

**N83-23938#** Department of Energy, New York. Environmental Measurements Lab.
**RADON AND RADON DAUGHTER MEASUREMENTS IN SOLAR ENERGY-CONSERVATION BUILDINGS**
A. C. George, E. O. Knutson, and H. Franklin Jul. 1982 16 p refs
(DE82-021874; DOE/EML-407) Avail: NTIS HC A02/MF A01

Measurements of radon and radon daughters in 11 buildings in five states, using active or passive solar heating showed no significant increase in concentration over the level measured in buildings with conventional heating systems. Radon concentrations were found to be normal levels. It appears that the slightly elevated indoor radon concentrations result from the local geological formations and from the tightening of the buildings rather than as a result of the solar heating technology. DOE

**N83-23939#** Sandia Labs., Albuquerque, N. Mex.
**STATUS OF FLOW-BATTERY RESEARCH IN THE UNITED STATES**
Robert P. Clark, Jay L. Chamberlin, Harry J. Saxton, and Philip C. Symons (Electrochemical Engineering Consultants, Inc.) 1982 26 p refs Presented at the 13th Intern. Power Sources Symp., Brighton, England, 27 Sep. 1982
(Contract DE-AC04-76DP-00789)
(DE82-020963; SAND-82-2055C; CONF-820907-3) Avail: NTIS HC A03/MF A01

Flow batteries are defined as electrochemical energy storage

devices in which at least one of the active materials is stored external to the power converting cell stack, and in which this soluble active material is circulated via the electrolyte, through the cell-stack during system charge or discharge. Research is reported on the following systems: zinc/chlorine batteries, zinc/bromine batteries, iron/chromium redox batteries, iron/ferric-ferrous chloride batteries, and zinc/ferro-ferricyanide batteries.
DOE

**N83-23940#** Sigma Research, Inc., Richland, Wash.
**DIRECT EXPANSION SOLAR COLLECTOR AND HEAT PUMP Final Report**
May 1982 95 p refs
(Contract DE-AC03-79SF-10542)
(DE82-014662; DOE/SF-10542/T1) Avail: NTIS HC A05/MF A01

A hybrid heat pump/solar collector combination in which solar collectors replace the outside air heat exchanger found in conventional air-to-air heat pump systems is discussed. The solar panels ordinarily operate at or below ambient temperature, eliminating the need to install the collector panels in a glazed and insulated enclosure. The collectors simply consist of a flat plate with a centrally located tube running longitudinally. Solar energy absorbed by exposed panels directly vaporizes the refrigerant fluid. The resulting vapor is compressed to higher temperature and pressure; then, it is condensed to release the heat absorbed during the vaporization process. Control and monitoring of the demonstration system are addressed, and the tests conducted with the demonstration system are described. The entire heat pump system is modelled, including predicted performance and costs, and economic comparisons are made with conventional flat-plate collector systems. DOE

**N83-23941#** Energy Systems Group, Inc., Atlanta, Ga.
**ANALYSIS OF FIELD-TEST DATA FROM DOMESTIC SOLAR-WATER HEATERS IN THE SOUTHERN UNITED STATES, PERIOD THROUGH MAY 1982**
William M. Jones and Ronald A. Jacobs Aug. 1982 95 p
(Contract DE-AC02-82CH-10122A)
(DE82-020532; DOE/CH-10122/2) Avail: NTIS HC A05/MF A01

Monitored performance data gathered from 103 solar water heaters are presented. All except 25 of the water heaters are located in Florida. The locations and system types of the solar water heaters are tabulated. The annual energy saved, solar savings fraction, return on investment, and gallons per purchased energy are given for the systems. Analysis of the thermal performance data is discussed. The solar water heater sites are ranked according to various thermal performance values, and thermal performance data are plotted. Presented with the plots are the mean and standard error of the particular groupings of monitored data. Operational statuses causing performance interruptions are tabulated. DOE

**N83-23942#** Sandia Labs., Albuquerque, N. Mex. Central Receiver Test Facility Div.
**BEAM QUALITY AND TRACKING-ACCURACY EVALUATION OF 2ND-GENERATION AND BARSTOW PRODUCTION HELIOSTATS**
David L. King Aug. 1982 129 p refs
(Contract DE-AC04-76DP-00789)
(DE82-022224; SAND-82-0181) Avail: NTIS HC A07/MF A01

The results are given of the optical performance and tracking accuracy evaluation of the second generation prototype heliostats and the Barstow production heliostat. Instrumentation, analytical techniques, and performance error sources are discussed. Full field performance predictions, and example cases of full field performance measurements at the CRTF are given. DOE

**N83-23943#** Boeing Computer Services Co., Tukwila, Wash. Energy Technology Applications Div.
**PHOTOVOLTAIC FIELD-TEST PERFORMANCE ASSESSMENT Interim Technology Status Report Number**
D. J. Inglis Aug. 1982 100 p Sponsored by EPRI
(EPRI Proj. 1607-1)
(DE82-906455; EPRI-AP-2544; ITSR-1) Avail: NTIS HC A05/MF A01

Performance descriptions are provided for four flat plate array photovoltaic field tests operated during 1981. The systems range in size from 18 kW to 100 kW. Three of them include dc to ac inverters; one uses dc directly. All of the sites have extensive instrumentation; readings are generally available every 10 minutes. Overall system conversion efficiencies for the newest systems are in the range 5.0 to 6.5 percent. Clear day capacity factors can be as high as 25 to 30%. On partly cloudy days capacity factors are considerably less. Clear day energy output from the arrays remains relatively constant throughout the year. The power conditioning subsystems are reliable and efficient. DOE

**N83-23944#** Rockwell International Corp., Golden, Colo. Energy Systems Group.
**WIND SYSTEMS TECHNICAL NOTES: 1979-1980**
Sally A. Shuler, comp. and Joel V. Stafford, ed. Feb. 1982 198 p refs
(Contract DE-AC04-76DP-03533)
(DE82-016358; RFP-3339) Avail: NTIS HC A09/MF A01

Technical Notes produced by the Rocky Flats Wind Systems Program in 1979-1980 to document specialized tests of small wind systems and other investigations are presented. Subjects include: vibration, dynamometer, and controlled velocity tests of 1 to 2 kW and 8 kW prototype wind systems; the use of induction generators; data collection and reporting procedures; analog-to-digital data conversion; optical rpm sensors; alternator frequency monitoring; and air density adjustments. A separate abstract was prepared for each of the technical notes. DOE

**N83-23945#** United Technologies Research Center, East Hartford, Conn.
**UTRC 15-kW WIND-SYSTEM DEVELOPMENT. PHASE 1, DESIGN AND ANALYSIS. VOLUME 2: TECHNICAL REPORT**
R. B. Taylor and M. C. Cheney Dec. 1981 181 p refs Prepared for Rockwell International Corp., Golden, Colo. 2 Vol.
(Contract DE-AC04-76DP-03533)
(DE83-021710; PFP-3331-2) Avail: NTIS HC A09/MF A01

A description is given of the design of a 15-kW wind turbine. The wind turbine employs the UTRC Composite Bearingless Rotor Concept in conjunction with a passive pendulum control system which controls blade pitch for start-up, efficient power generation, and high-speed survivability. Also included is a summary of experimental material and component tests which were performed in support of the wind turbine design. Studies of system reliability, maintainability, availability and safety are reported and an estimate of the cost-of-energy is also made for a production wind system. DOE

**N83-23946#** United Technologies Research Center, East Hartford, Conn.
**UTRC 15-kW WIND-SYSTEM DEVELOPMENT. PHASE 1, DESIGN AND ANALYSIS. VOLUME 1: EXECUTIVE SUMMARY**
R. B. Taylor and M. C. Cheney Dec. 1981 19 p Prepared for Rockwell International Corp., Golden, Colo. 2 Vol.
(Contract DE-AC04-76DP-03533)
(DE82-021709; RFP-3331-1) Avail: NTIS HC A02/MF A01

The wind system consists of a horizontal-axis, two-bladed, down-wind rotor, which is free in yaw and is supported by a cantilevered free standing tower. Control of blade pitch is provided by a passive system consisting of pendulums which are sensitive to centrifugal forces created by rotor rotation. Rotor speed control in high winds is achieved by blade stall and the system is designed to withstand gusts up to 56 m/s. The design of the electrical system, head assembly, and nacelle and the tower design and erection are described briefly. Also discussed is the system analysis, consisting of predicted power output and annual energy capture, cost of energy, analysis of loads and stresses, availability, and safety. Experimental tests were performed in support of

the design in the areas of materials evaluation and component testing. DOE

**N83-23947#** Kohring (Gene W.), Hamilton, Ohio.
**FEASIBILITY STUDY OF WIND-GENERATED ELECTRICITY FOR RURAL APPLICATIONS IN SOUTHWESTERN OHIO Final Technical Report**
Gene W. Kohring 1982 29 p
(Contract DE-FG02-80R5-10242)
(DE82-021596; DOE/R5-10242/T1) Avail: NTIS HC A03/MF A01

The parameters associated with domestic production of wind generated electricity ıor direct use by small farms and rural homes in the southwestern Ohio region are discussed. The project involves direct utility interfaced electricity generation from a horizontal axis, down-wind, fixed pitch, wind powered induction generator system. Goals of the project are to determine: the ability to produce useful amounts of domestic wind generated electricity in the southwestern Ohio region; economic justification for domestic wind generated electrical production; and the potential of domestic wind generated electricity for reducing dependence on non-renewable energy resources in the southwestern Ohio region. DOE

**N83-23948#** Sandia Labs., Albuquerque, N. Mex. Geothermal Research Div.
**MAGMA ENERGY RESEARCH PROJECT, FY80 ANNUAL PROGRESS REPORT Annual Progress Report**
John L. Colp, ed. Apr. 1982 109 p refs
(Contract DE-AC04-76DP-00789)
(DE82-021128; SAND-81-0100) Avail: NTIS HC A06/MF A01

The technical feasibility of extracting energy from magma bodies is explored. Five aspects of the project are studied: resource location and definition, source tapping, magma characterization, magma/material compatibility, and energy extraction. DOE

**N83-23949#** City of El Centro, Calif. Dept. of Public Works.
**IMPERIAL COUNTY GEOTHERMAL DEVELOPMENT Progress Report, 1979-1982**
Oct. 1982 29 p
(Contract DE-FC03-79ET-27196)
(DE83-002779; DOE/ET-27196/T8) Avail: NTIS HC A03/MF A01

The progress of geothermal development during the past 3 years, county activities in support of geothermal development, and current challenges and future needs of the geothermal industry and the county are summarized. Three additional Known Geothermal Resources Areas (KGRAs) were identified: the Westmorland KGRA, the East Brawley KGRA, and the South Brawley KGRA. Three 10 megawatt power plants began operations during the grant period. Three commercial power plants are scheduled to begin construction during late 1982 or early 1983. Site work was begun for the Heber Flash Power Plant. Two commercial power plants are in planning stages. DOE

**N83-23950#** Northrop Univ., Inglewood, Calif. Energy Research Center.
**THE POLARIS: A NEW TECHNOLOGY FOR LOW-COST SOLAR/GAS WATER HEATERS Final Report, Dec. 1980 - Feb. 1982**
David G. Pelka Feb. 1982 100 p refs Sponsored by Gas Research Institute
(PB83-126060; GRI-81/10054) Avail: NTIS HC A05/MF A01 CSCL 13A

A low-cost solar/gas augmented system (POLARIS) was designed, fabricated, and tested in prototype form. Based upon F-chart analysis, and when averaged over the U.S., this system would supply 48% of the annual heating load for a family of four. As part of this system, a new type of optical lens was fabricated which has major advantages over existing Fresnel lens systems. A new Freon driven tracking system was developed. This system tracked to within 1 degree accuracy and required no electric power for operation. In addition, modeling of various solar/gas interface scenarios was accomplished. These studies indicated that the most cost-effective overall system use occurred when an instantaneous point-of-use gas water heater was incorporated into the POLARIS system. Author (GRA)

**N83-23951#** Fauske and Associates, Inc., Burr Ridge, Ill.
**DESICCANT COOLING SYSTEM PERFORMANCE: A SIMPLE APPROACH Final Report, Oct. 1981 - Oct. 1982**
Michael Epstein and Michael A. Grolmes Oct. 1982 90 p refs Sponsored by Gas Research Inst.
(PB83-126250; FAI-82/23; GRI-81/0089) Avail: NTIS HC A05/MF A01 CSCL 13A

The wave nature of heat and mass transfer in fixed desiccant bed adsorption is explained. A simple algebraic model of wave motion under single low desiccant bed operation is developed and applied to the prediction of the performance potential of the overall desiccant cooling system. The model is used to explain the increase in cooling system performance that is realized through the use of mixed inert desiccant material adsorption beds. The response of cooling system performance to changes in external process conditions is examined and conclusions are drawn relative to optimization of system characteristics. GRA

**N83-23952#** Radiotechnique-Compelec, Caen (France). Industrial and Technical Div.
**IMPROVEMENT IN THE PERFORMANCE OF SOLAR ENERGY PILES USING LARGE-DIAMETER SILICON MATERIAL Final Report**
D. Diguet Nov. 1982 42 p Transl. into ENGLISH of the mono. "Amelioration des Performance de la Pile Solair au Silicium de Grand Diametre" (France), 1981 50 p
(PB83-128686; EUR-7095-FR) Avail: NTIS HC A03/MF A01 CSCL 10B

In an effort to reduce the cost of solar energy piles (generator/cell), comparative analyses were undertaken to show that improvements in the production of large diameter silicon material depend on the selection of ingots according to: (1) the oxygenconcentration, for which a maximum level has been established; (2) the presence of lines of slip. In addition, a simpified process for the preparation of substrates was developed; studies were carried out on fully automatic surface treatment; the use of screen printing methods and materials to be applied to the system on contacts was investigated, and a process for welding connections was developed possessing a capacity of around 300 pieces/hour; automatic equipment was designed for the deposition of the anti-reflection bed. GRA

**N83-23953#** National Bureau of Standards, Washington, D.C.
**FACTORS AFFECTING THE SERVICE LIVES OF PHASE CHANGE STORAGE SYSTEMS**
John B. Ings and Paul Wencil Brown Feb. 1982 21 p refs Sponsored in part by DOE
(PB83-137174; NBSIR-81-2422) Avail: NTIS HC A02/MF A01 CSCL 10C

Phase change storage systems currently in use or which are in the advanced stages of development are identified. Various possible modes of degradation which may affect service lives are considered. Specifically, the effects of crystal growth, crystal segregation, supercooling, corrosion and thermal decomposition are discussed. The generic basis for the development of performance tests for inorganic phase change materials is described. Author (GRA)

# 45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

**N83-23954#** Committee on Public Works and Transportation (U.S. House).
**OCEAN DUMPING**
GPO 1982 265 p Hearing on H.R. 6113 before the Subcomm. on Water Resources of the Comm. on Publ. Works and Transporta-

tion, 97th Congr., 2d Sess., 16 Jun. 1982
(GPO-11-258) Avail: Subcommittee on Water Resources

The regulation of the dumping of materials into the ocean is reviewed. Criteria to be applied in reviewing and evaluating permit applications for the transportation and dumping of materials into the ocean are established. A definition of monitoring of dumping sites, the assessment of fees to cover permit processing costs, and a moratorium is placed on the issuance of permits for the disposal of radioactive waste are included. S.L.

**N83-23955*#** Kentron Technical Center, Hampton, Va.
**KERR RESERVOIR LANDSAT EXPERIMENT ANALYSIS FOR NOVEMBER 1980**
Stuart R. LeCroy May 1982 50 p refs
(Contract NAS1-16000)
(NASA-CR-165924; NAS 1.26:165924) Avail: NTIS HC A03/MF A01 CSCL 13B

An experiment was conducted on the waters of Kerr Reservoir to determine if reliable algorithms could be developed that relate water quality parameters to remotely sensed data. LANDSAT radiance data was used in the analysis since it is readily available and covers the area of interest on a regular basis. By properly designing the experiment, many of the unwanted variations due to atmosphere, solar, and hydraulic changes were minimized. The algorithms developed were constrained to satisfy rigorous statistical criteria before they could be considered dependable in predicting water quality parameters. A complete mix of different types of algorithms using the LANDSAT bands was generated to provide a thorough understanding of the relationships among the data involved. The study demonstrated that for the ranges measured, the algorithms that satisfactorily represented the data are mostly linear and only require a maximum of one or two LANDSAT bands. Rationing techniques did not improve the results since the initial design of the experiment minimized the errors that this procedure is effective against. Good correlations were established for inorganic suspended solids, iron, turbidity, and secchi depth.
Author

**N83-23956#** Committee on Energy and Commerce (U. S. House).
**DISPOSAL OF HAZARDOUS WASTES IN MINES: A CASE STUDY AT NORTON, OHIO**
Washington GPO 1982 127 p refs Hearing before the Subcomm. on Com., Transportation, and Tourism of the Comm. on Energy and Com., 97th Congr., 2nd Sess., 31 Aug. 1982
(GPO-11-518) Avail: Subcommittee on Commerce, Transportation, and Tourism

Questions with regard to a proposed siting of a hazardous waste storage and disposal facility in an inactive mine are examined. Author

**N83-23957#** Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
**ENVIRONMENTAL DATA ACQUISITION SYSTEM IN CASSETTE TAPE IN DIGITAL FORM**
Marcos Antonio Rodrigues, Azhaury C. Cunha Filho, and Eduardo M. B. Alonso Nov. 1982 9 p In PORTUGUESE; ENGLISH summary Presented at the 2nd Brazil. Meteorol. Conf., Pelotas, 1982
(INPE-2572-PRE/220) Avail: NTIS HC A02/MF A01

A remote digital magnetic recording system for digital or analogic signals is described, which provides an output compatible with most computer systems. The complete system consists of sensors, sensors interfaces, data logging and reader. The output may be, for example, a computer printing displaying the measured physical quantities in the proper units and the date and time of each measurements as well as eventually the result of some computations done. A prototype of such equipment was developed at INPE and is currently at its industrialization stage. Author

**N83-23958#** Du Pont de Nemours (E. I.) and Co., Aiken, S.C. Environmental Transport Div.
**DEPOSITION OF AIR-BORNE Pu-238 NEAR A CHEMICAL SEPARATION FACILITY**
J. H. Horton and D. D. Gay Jan. 1982 19 p
(Contract DE-AC09-76SR-00001)
(DP-1585) Avail: NTIS HC A02/MF A01

Three methods were compared to measure deposition of Pu-238 released from a chemical separation facility. The methods were: (1) adhesive paper, (2) a collector of rain and dryfall, and (3) soil samples. Excellent agreement among the three methods was found. The measured deposition for the particular source term and meteorological conditions is described by y varies as x to the -1.36th power where y is the pCi of Pu-238 deposited per square meter per mCi Pu-238 released, and x is distance in meters from the source. S.L.

**N83-23959#** Southern Research Inst., Birmingham, Ala.
**EVALUATION OF PULSE ENERGIZATION ON A HOT-SIDE ELECTROSTATIC PRECIPITATOR Final Report**
J. P. Gooch, G. H. Marchant, Jr., J. L. DuBard, and J. R. McDonald Nov. 1982 88 p refs Sponsored in part by the Southern Co. Services
(Contract EPA-68-02-2656; EPRI Proj. 1868-2)
(DE83-900742; EPRI-CS-2634) Avail: NTIS HC A05/MF A01

The application of pulse energization to a hot side generating station precipitator are evaluated. The hot side precipitator had experienced performance degradation, which could be corrected by sodium sulfate conditioning of the coal. Pulsing systems were temporarily installed on the precipitator; the arrangement of pulsed fields was different on Sides A and B, and the two pulsing systems produced very different electrical pulse waveforms. When the unit had operated for seven days after washdown, with no sodium conditioning of the coal, the ESP performance had degraded to the point that the unit could not be operated at full load in compliance with local emissions standards, not even with both pulsing systems in operation. Thereafter, the unit was operated with minimal sodium conditioning, at the level of 0.7% Na2O in the ash. With no sodium conditioning, the Method 17 mass sampling results indicated that penetration decreased from 3.33% to 1.57% on the B side, and from 3.76% to 1.68% on the A side as a result of pulsing. DOE

**N83-23960#** Mississippi State Univ., Mississippi State.
**EFFECTS OF INCREASED CO SUB 2 ON PHOTOSYNTHESIS AND AGRICULTURAL PRODUCTIVITY. VOLUME 2, PART 6. ENVIRONMENTAL AND SOCIETAL CONSEQUENCES OF A POSSIBLE CO SUB 2-INDUCED CLIMATE CHANGE**
Donald N. Baker, L. Hartwell Allen, Jr. (Florida Univ.), and Jerry R. Lambert (Clemson Univ.) Oct. 1982 109 p refs
(Contract DE-AS01-79EV-10019)
(DE83-003029; DOE/EV-10019/6) Avail: NTIS HC A06/MF A01

The direct effects of increased CO2 concentration on plant processes, and the indirect effects of climate changes caused by increased CO2 concentrations are discussed. Growth of a crop involves several physiological processes, e.g., photosynthesis, respiration and transpiration. The integral of these and other processes over a season results in yield - grain, tubers, etc. Both positive and negative responses of these processes to climatic changes occur. Some of these individual responses are known; many others are not. Because of the complex nature of the interdependence and feedback of the total physiological system, quantitative prediction of the net response to a climatic change, especially in genotypes yet to be developed, is impossible. Therefore a systems simulation analysis is necessary. Research needs, to evaluate the effects of increased CO2 on agricultural productivity, include the need for controlled environment experiments to measure crop responses to climate, done in such a way that the resulting data are useful in system studies. DOE

**N83-23961#** California Univ., Livermore. Lawrence Livermore Lab.
**ARAC TERRAIN DATA BASE**
Hoyt Walker Nov. 1982 17 p
(Contract W-7405-eng-48)
(DE83-003151; UCID-19599) Avail: NTIS HC A02/MF A01

A terrain data base covering the continental United States at

500-meter resolution was generated. Its function is to provide terrain data for input to mesoscale atmospheric models that are used as part of the Atmospheric Release Advisory Capability at Lawrence Livermore Laboratory (LLNL). The structure of the data base as it exists on the LLNL computer system is described. The data base was written to tapes for transfer to other systems. The format of these tapes is also described. DOE

**N83-23962#** Los Alamos Scientific Lab., N. Mex.
**ECONOMIC AND REGULATORY EFFICIENCY IN AIR-POLLUTION CONTROL Ph.D. Thesis - Stanford Univ.**
Charles Durgin Kolstad Jul. 1982 258 p refs
(Contract W-7405-eng-36)
(DE82-021149; LA-9458-T) Avail: NTIS HC A12/MF A01

This dissertation provides a bride between oversimplified analyses of regulatory alternatives and undersimplified perceptions of the air pollution problems by regulators. Some of the more critical realistic aspects of air pollution such as time-varying pollutant transport, locational aspects of pollution control, demand for goods jointly produced with pollution, and uncertainty are discussed. Optimal levels and distribution of pollution as well as the efficiency of alternate regulatory structures in achieving optimality are explored. DOE

**N83-23963#** Colorado Univ., Denver. Center for Environmental Sciences.
**OIL SHALE ENVIRONMENTAL RESEARCH AND COORDINATION Progress Report, 1981 - 1982**
Willard R. Chappell 1982 351 p refs
(Contract DE-AC02-79EV-10298)
(DE82-020762; DOE/EV-10298/4) Avail: NTIS HC A16/MF A01

The environmental impacts of an oil shale industry and strategies to mitigate these effects are discussed. A comprehensive study of the sources, release mechanisms, transport, fate, and effects of toxic trace substances, principally the trace elements, in an oil shale industry was done. The coordination and research management of the program are discussed. DOE

**N83-23964#** California Univ., Livermore. Lawrence Livermore Lab.
**RAMAN/FTIR SPECTROSCOPY OF OIL SHALE RETORT GASES**
J. H. Richardson, S. B. Monaco, R. H. Sanborn, T. B. Hirschfeld, and J. R. Taylor Aug. 1982 15 p refs
(Contract W-7405-eng-48)
(DE82-021011; UCID-19547) Avail: NTIS HC A02/MF A01

A Raman facility was assembled in order to aid in the evaluation of the feasibility of using Raman or Fourier transform infrared spectrocopy for analyzing gas mixtures of interest in oil shale. Applications considered in oil shale research included both retort monitoring and laboratory kinetic studies. Both techniques gave limits of detection between 10 and 1000 ppM for ten representative pertinent gases. Both techniques are inferior as a general analytical technique for oil shale gas analysis in comparison with mass spectroscopy, which had detection limits between 1 and 50 ppM for the same gases. The conclusion of the feasibility study was to recommend that mass spectroscopic techniques be used for analyzing gases of interest to oil shale. DOE

**N83-23965#** Hoffman-Holt, Inc., Silver Spring, Md.
**THE EFFECT OF COAL CLEANING ON THE QUANTITY OF SULFUR DIOXIDE AND ASH PRODUCED BY COAL-FIRED POWER GENERATION IN THE NORTHEASTERN UNITED STATES**
Richard M. Jones and Martin V. Jones 15 May 1982 141 p refs
(Contract DE-AC01-75ET-12512)
(DE82-016060; DOE/ET-12512/2) Avail: NTIS HC A07/MF A01

The extent to which coal cleaning could reduce sulfur dioxide and ash output by Northeastern utilities is estimated. Total permissible SO2 release was calculated for each state and the entire region based upon applicable environmental regulations. These results were compared with SO2 outputs corresponding to the compositions of the coals reported by the utilities and the compositions of cleaned coals derived from laboratory data. The results indicated that the assumed fine coal physical cleaning methods could reduce total SO2 output by as much as 42% (as compared to reported coal compositions) and that advanced chemical cleaning technologies could achieve potential reductions of approximately 90%. Corresponding reductions were determined for ash wastes: the reported coals could be expected to produce about 14 million tons of ash; physically cleaned coals about 4 million tons; and advanced chemically cleaned coals approximately 1.3 million tons. DOE

**N83-23966#** Argonne National Lab., Ill. Chemical Engineering Div.
**ALKALI METAL VAPOR REMOVAL FROM PRESSURIZED FLUIDIZED-BED-COMBUSTOR FLUE GAS Quarterly Report, Oct. - Dec. 1981**
Irving Johnson and S. H. D. Lee May 1982 21 p refs
(Contract W-31-109-eng-38)
(DE82-019233; ANL/FE-82-8) Avail: NTIS HC A02/MF A01

A program to develop methods for cleanup of combustion gases from pressurized fluidized-bed coal (PFBC) combustors so that the cleaned gases can be used to power down-stream gas turbines without causing corrosion is discussed. A simulated PFBC flue gas was used in testing activated bauxite in a granular bed filter for its NaCl-vapor sorption performance at a bed temperature of 905 C and a system pressure of 10 atm absolute. Greater than 99.8% NaCl-vapor capture efficiency was achieved. Changes in the activated bauxite's chemical properties as a result of exposure to the simulated flue gas are described, and possible explanations for the changes are discussed. DOE

**N83-23967#** Institute for Energy Analysis, Oak Ridge, Tenn.
**CARBON DIOXIDE EFFECTS RESEARCH AND ASSESSMENT PROGRAM**
Noelle B. Beatty 1981 554 p refs Presented at the Conf. on the 1st Detection of Carbon Dioxide Effects, Harpers Ferry, W. Va., 8-10 Jun. 1981
(Contracts DE-AC05-76OR-00033; W-7405-eng-48)
(DE82-016633; CONF-8106214) Avail: NTIS HC A24/MF A01

The effects of carbon dioxide in the atmosphere are discussed. The role of atmospheric models in detecting CO2 climatic effects is discussed. The statistical methodology for the first detection of CO2 effects in the atmosphere is discussed, as is the detection of climate change due to increased CO2 concentrations. DOE

**N83-23968#** Olympic Associates Co., Seattle, Wash.
**LIQUID- AND SOLID-WASTE MANAGEMENT FOR COAL-CONVERSION PROCESSES Final Report**
R. H. Bogan, R. T. Skrinde, and D. D. Jech Feb. 1982 146 p refs Sponsored by EPRI
(EPRI Proj. 1658-02)
(DE82-902103; EPRI-AP-2245) Avail: NTIS HC A07/MF A01

The results of a technical assessment of pollution control technology for liquid and solid wastes expected from coal conversion processes, are given. Treatment schemes which were proposed for four typical liquefaction and gasification processes are evaluated and promising alternative approaches are identified. Analytical methods applicable to coal conversion waste streams are reviewed and assessment is made of the potential for stricter environmental standards resulting from better analytical techniques in the future. The implications of more stringent standards are discussed, including means to achieve zero discharge of liquid effluents. State of the art treatment schemes are developed and detailed for each of four processes: Lurgi fixed bed gasification, Texaco entrained bed gasification, H-Coal catalytic liquefaction and Exxon Donor Solvent (noncatalytic) liquefaction. Various possible options for recycling of treated and untreated waste streams are identified for each process. DOE

**N83-23969#** Physical Dynamics, Inc., La Jolla, Calif.
**SOURCE-RECEPTOR RELATIONSHIP IN ACID PRECIPITATION: IMPLICATIONS FOR GENERATION OF ELECTRIC POWER**

**FROM COAL Final Report**
John R. Wiesenfeld (Cornell Univ.) and William T. Kreiss 1982 93 p refs
(Contract DE-FG01-81FE-16114)
(DE82-019307; PD-LJ-82-268R) Avail: NTIS HC A05/MF A01

The conclusions of a technical panel convened to examine the source receptor relationship in acid precipitation are reported. While a decrease in acid deposition is certainly a worthy goal for pursuit, the ecological consequences with or without such decreases are uncertain. Assessment of the benefits to be derived (in terms of deposition abatement) from the imposition of emission controls remains a matter of significant uncertainty. A better understanding of the source receptor relationship must be gained in order to optimize the benefits of a major emission reduced program so that the likely benefits of alternative control strategies may be estimated with reasonable accuracy. Specific questions identified by the workshop panel as being of direct importance to the refinement of the source receptor relationship are related. DOE

**N83-23970#** Interagency Task Force on Acid Precipitation, Washington, D.C.
**NATIONAL ACID PRECIPITATION ASSESSMENT PLAN**
Jun. 1982 101 p refs
(DE83-002939; DOE/NBM-3002939) Avail: NTIS HC A06/MF A01

The Plan on acid precipitation assessment has five parts. The authorizing legislation and the organization of the Plan itself are described. Previous federal planning efforts in the current acid rain research programs are discussed. In part a general overview of current understanding of the phenomenon and consequences of acid rain is presented. Subjects discussed include: evidence of trends in rainfall acidity; possible sources of acid precipitation; atmospheric chemistry and transport; monitoring of acid deposition; the effects of acid precipitation; the relationship of acid precipitation to human health; and control technologies and mitigation of impacts. Nine categories of information needed to enhance our ability to make sound energy, environmental, economic, and resource policy decisions are identified: (1) natural sources; (2) man made sources; (3) atmospheric processes; (4) deposition monitoring; (5) aquatic impacts; (6) terrestrial impacts; (7) effects on materials and cultural resources; (8) control technologies; and (9) assessment and policy analysis. Possible indirect effects on human health are addressed in both categories (5) and (6). The research proposed to address these information needs and the management and coordination of the program are described. DOE

**N83-23971#** California Univ., Livermore. Lawrence Livermore Lab.
**EVALUATION OF PERMANENTLY CHARGED ELECTROFIBROUS FILTERS**
A. H. Biermann, B. Y. Lum, and W. Bergman 18 Oct. 1982 26 p refs Presented at the 17th DOE Nucl. Air Cleaning Conf., Denver, 2-5 Aug. 1982
(Contract W-7405-eng-48)
(DE83-001616; UCRL-87535; CONF-820833-14) Avail: NTIS HC A03/MF A01

These studies showed that loading the permanently charged filters with captured aerosols will lead to a neutralization of the filter charge. The transfer from the captured aerosol to the fiber surface and the subsequent neutralization of fiber charge. The increased efficiency is due to the additional mechanical capture by the particle deposits. The minimum efficiency obtained during the loading of solid aerosols is determined by the aerosol charge, with highly charged aerosols producing a lower minimum. Permanently charged filters lose their fiber charge when exposed to organic solvents or ionic water solutions. The fiber charge neutralization was minimized by coating the charged fibers with a polymer. Several different coating techniques were examined. Unfortunately, preventing the neutralization of fiber charge is not sufficient to prevent a deterioration of filter efficiency. DOE

**N83-23972#** California Univ., Los Angeles. Dept. of Earth and Space Sciences.
**PETROLEUM HYDROCARBONS IN STORMWATER RUNOFF AND MUNICIPAL WASTES: INPUT TO COASTAL WATERS AND FATE IN MARINE SEDIMENTS**
Robert P. Eganhouse, Dara L. Blumfield, and Isaac R. Kaplan 1982 35 p refs Presented at the 7th Intern. Symp. Chem. of the Mediterranean Transport and Reactivity of Pollutants in the Estuary, Primosten, Yugoslavia, 6-12 May 1982
(Contract DE-AT03-76EV-70134)
(DE83-001318; CONF-8205127-1) Avail: NTIS HC A03/MF A01

Urban stormwaters, municipal wastes and waste-affected ocean sediments were sampled and then analyzed for their hydrocarbon content and composition. The hydrocarbon concentrations in runoff are highly variable ranging from 1 to 20 mg per liter and making up approximately 60% of the total extractable organic matter. Wastewater hydrocarbon concentrations are of similar magnitude (5 to 23 mg per liter). However, the temporal variability is much lower. Estimates for the mass emission rates of runoff and wastewater hydrocarbons to the ocean in southern California are 9700 and 17,400 metric tons per year, respectively. Thus, municipal effluents contribute almost twice the amount of oil to coastal waters as does rainfall runoff in this region. Compositionally, the hydrocarbons in both sources resemble a mixture of various petroleum products, biogenic components being, at most, minor constituents. DOE

**N83-23973#** Oak Ridge National Lab., Tenn. Environmental Sciences Div.
**PREPARATION OF ENVIRONMENTAL ANALYSES FOR SYNFUEL AND UNCONVENTIONAL GAS TECHNOLOGIES**
Robert M. Reed, ed. Sep. 1982 210 p refs
(Contract W-7405-eng-26)
(DE83-001718; ORNL-5911; Publ-1843) Avail: NTIS HC A10/MF A01

Potentially significant environmental issues associated with a selection of synfuel technologies are discussed and guidance is given for developing information and preparing analyses to address these issues. The technologies considered are western oil shale, tar sand, coal liquefaction and gasification, peat unconventional gas (western tight gas sands, eastern Devonian gas shales, methane from coal seams, and methane from geopressured aquifers), and fuel ethanol. Potentially significant issues are discussed under the general categories of land use, air quality, water use, water quality, biota, solid waste disposal, socioeconomics, and health and safety. The guidance provided can be applied to preparation and/or review of proposals, environmental reports, environmental assessments, environmental impact statements, and other types of environmental analyses. DOE

**N83-23974#** State Univ. of New York, Stony Brook. Marine Sciences Research Center.
**COAL-WASTE ARTIFICIAL-REEF PROGRAM, PHASE 4A**
J. H. Parker, P. M. J. Woodhead, I. W. Duedall, and H. R. Carlton Sep. 1982 361 p refs Sponsored by EPRI
(EPRI Proj. 1341-1)
(DE83-001249; EPRI-CS-2574) Avail: NTIS HC A16/MF A01

The environmental effects of disposing of fly ash and scrubber sludge in the ocean in the form of stabilized blocks is discussed. An artificial reef was constructed in the Atlantic Ocean with 500 tons of coal waste blocks on 12 September 1980. To detect potential environmental effects due to the presence of the reef and to determine the success of the coal waste blocks as a substrate for colonizing organisms, several biological studies were conducted. Results to date indicate that the blocks were colonized within weeks after placement in the ocean and the fish population was quickly established. The resident fish community was sampled and fish were tagged and released in order to estimate population size and rate of growth. Bioassays for toxicity were also conducted with sensitive life forms. The chemical behavior of the blocks exposed to seawater was monitored by determining the elemental composition and mineralogy of blocks retrieved from the reef site. DOE

**N83-23975#** Brookhaven National Lab., Upton, N. Y.
**NEW INSTRUMENTATION FOR AIRBORNE ACID-RAIN RESEARCH**
Roger L. Tanner, Peter H. Daum, and Thomas J. Kelly Apr. 1982 21 p refs Presented at the 11th Ann. Symp. on the Anal. Chem. of Pollutants, Amsterdam, 14-16 Apr. 1982
(Contract DE-AC02-76CH-00016)
(DE82-019543; BNL-31596; CONF-820474-1) Avail: NTIS HC A02/MF A01

Instrumental methods were developed for continuously measuring sulfur dioxide, aerosol sulfur, nitrogen oxides, nitric acid, and ammonia from an aircraft sampling platform. Emphasis was on modifications to reduce limits of detection to allow sampling an ambient concentrations in the vicinity of clouds. Characterizations based on ambient sampling data, in conjunction with data on cloud water composition and knowledge of the interphase behavior of nitrogen and sulfur oxides and oxyacids, will be used for quantitative evaluation of species contributions to the ionic content of precipitation. A flame photometric instrument with enhanced sensitivity for airborne measurements of both gaseous and aerosol sulfur compounds was designed and constructed. Ambient airborne levels of less than one ppb may be detected using sensitivity enhancement, and effects of pressure changes on instrumental response were eliminated. DOE

**N83-23976#** Battelle Columbus Labs., Ohio.
**RESPONSE OF AGRICULTURAL SOILS TO ACID DEPOSITION**
M. F. Arthur and C. K. Wagner Jul. 1982 142 p refs Presented at EPRI Workshop on Response of Agricultural Soils to Acid Deposition, Columbus, Ohio, 12-13 May 1981 Sponsored by Electric Power Research Inst.
(EPRI Proj. 1904-1)
(DE82-906474; EPRI-EA-2508; CONF-8105185) Avail: NTIS HC A07/MF A01

The potential beneficial and harmful impacts of atmospheric acid deposition on agricultural soils are presented. Those issues requiring further research are also identified. Sensitivity ratings of soils to acid deposition are discussed. The impacts of acid deposition on N and S cycling and on Biota and C are discussed. The impact of acid deposition on micronutrients cycling in agroecosystems is discussed. DOE

**N83-23977#** California Univ., Berkeley. Lawrence Berkeley Lab. Energy and Environment Div.
**VALIDATION OF A PASSIVE SAMPLER FOR DETERMINING FORMALDEHYDE IN RESIDENTIAL INDOOR AIR**
A. T. Hodgson, K. L. Geisling, B. Remijn, and J. R. Girman Sep. 1982 29 p refs
(Contract DE-AC03-76SF-00098)
(DE83-001226; LBL-14626; EEB-Vent-82-10) Avail: NTIS HC A03/MF A01

A passive sampling device based on the principle of diffusion was developed specifically for the determination of formaldehyde in residential indoor air. The device, which is inexpensive and easy to use, is capable of measuring one-week time-weighted average concentrations of formaldehyde from as low as 0.018 ppM to over 1 ppM. The sampler was validated by a series of laboratory experiments and a field study conducted in occupied residences and an office. The parameters evaluated in the laboratory and field experiments were: sampling rate; sampling period; detection limit; relative humidity effects; chemical interferences; shelf life; sample stability; overall precision; bias; and overall accuracy. The performance of the passive sampler compared favorably to that of a reference pump/bubbler sampler. DOE

**N83-23978#** Michigan State Univ., Hickory Corners.
**DISSOLVED ORGANIC MATTER AND LAKE METABOLISM: BIOGEOCHEMISTRY AND CONTROLS OF NUTRIENT FLUX DYNAMICS IN LAKES Technical Progress Report, 1 Aug. 1981 - 25 Aug. 1982**
Robert G. Wetzel 1982 49 p refs
(Contracts DE-AC02-76EV-01599; EY-76-S-02-1599)
(DE82-021861; DOE/EV-01599/219-Pt-1; COO-1599-219-Pt-1) Avail: NTIS HC A03/MF A01

The regulatory mechanisms of growth and rates of carbon cycling that focuses on detailed evaluation of quantitative control interactions among: (1) the microflora of the pelagial zones of several lakes of progressively greater eutrophy; (2) littoral and wetland photosynthetic producer decomposer complex; and (3) allochthonous inorganic/organic influxes and their biotic processing are analyzed. The underlying thesis is that quantification of the dynamic carbon fluxes among these components and their rate control mechanisms by physical and chemical factors are fundamental to elucidation of the rate functions of lake productivity and compensatory mechanisms in response to changes. The fate and nutrient mechanisms regulating quanlitative and quantitative utilization and losses of organic carbon synthesized within lakes and their drainage basins were investigated. It is apparent that the wetland and littoral flora, and attendant epiphytic and benthic miroflora, have major regulatory controls on biogeochemical cycling of whole lake systems. A major effort on factors regulating the metabolism of littoral and wetland macrophytes and attached algae is coupled to integrated studies on their decomposition and the fate of detrital dissolved and particulate organic matter. These organic products are coupled to influences on enzymatic activity and inorganic nutrient cycling, and resultant effects on phytoplankton community and productivity. DOE

**N83-23979#** Environmental Research and Technology, Inc., Westlake Village, Calif.
**SULFATE REGIONAL EXPERIMENT: REGIONAL AIR-QUALITY-MODELING DOCUMENTATION Interim Report**
P. K. Mueller and G. M. Hidy Aug. 1982 185 p refs
(EPRI Proj. 862-2)
(DE82-906473; EPRI-EA-1907) Avail: NTIS HC A09/MF A01

Documentation is provided fo the Sulfate Regional Advection and Diffusion Scheme (SURADS). Important factors in three of the SURADS model components are described. In particular, parts of the Meteorological Discretization System (MDS), the Air Quality Initialization System (AQIS), and the Numerical Integration System of the SURADS are detailed. In the MDS, temporally and spatially varying vertical eddy diffusivity is determined from wind speed, surface temperature, temperature soundings, and surface roughness. Wind fields at five levels in the vertical are interpolated each hour from twice daily rawinsonde data. Calculations of winds required that the horizontal divergence be minimized to approach zero in each level of the wind field while the vorticity is maintained. The practical considerations for using chemical reactions of different complexity in regional models are discussed with application to the AQIS. DOE

**N83-23980#** Environmental Research and Technology, Inc., Westlake Village, Calif.
**SULFATE REGIONAL EXPERIMENT: DATA BASE INVENTORY AND SUMMARY OF MAJOR INDEX FILE PROGRAMS Interim Report**
P. K. Mueller and G. M. Hidy Aug. 1982 113 p refs
(EPRI Proj. 862-2)
(DE82-906472; EPRI-EA-1904) Avail: NTIS HC A06/MF A01

The composition and format of the SURE data base is described. The prospective user of the SURE data base is presented with a listing of the percent data capture of the currently available validated data by site and month for each observable, a summary of major files and programs used to access and manipulate the data, and a format description of all data files incorporated into the data base. The user may request data from four categories: ground station monitored air quality data, aircraft monitored air quality data, upper air and surface meteorological observations, and the emissions inventory compiled for the SURE region. DOE

**N83-23981#** California Univ., Berkeley. Lawrence Berkeley Lab. Marine Sciences Group.
**ENVIRONMENTAL MONITORING AT KAHE POINT, OAHU, HAWAII FOR OTEC PILOT PLANT DEVELOPMENT**
A. T. Dengler, V. Harms, E. O. Hartwig, M. S. Quinby-Hunt, P.

Wilde, and L. Lewis (DOE, Washington) Aug. 1982 8 p Presented at the Marine Technol. Soc. and Geol. Soc. of Am. Conf. on Oceans, Washington, D.C., 20 Sep. 1982
(Contract DE-AC03-76SF-00098)
(DE82-020979; LBL-14799; CONF-820926-4) Avail: NTIS HC A02/MF A01

Two 40 MWe ocean thermal energy conversion (OTEC) pilot plant programs are in the initial phase of development near Kahe Point, Oahu, Hawaii. Two options are examined: (1) a shelf seated artificial island, connected via a causeway to Oahu, using stainless steel heat exchangers, with the thermal resource enhanced by effluent from a nearby power plant, ammonia working fluid and biocide (chlorine) cleaning; and (2) a shelf mount tower 1 mile off shore using submerged aluminum heat exchangers, R-22 working fluid, and slurry cleaning with biocide (chloride) backup. Environmental technical requirements are described including: siting criteria; environmental design, and operational criteria; thermal resource evaluation and variability; physical, chemical, and biological data requirements; and regulatory requirements. DOE

**N83-23982#** Aerospace Corp., El Segundo, Calif.
**ASSESSMENT OF SIMULTANEOUS USE OF NOx CONTROL SYSTEMS ON STATIONARY SOURCES IN CALIFORNIA. VOLUME 2: TECHNICAL DISCUSSION Final Report**
J. R. Witz and P. P. Leo Feb. 1982 188 p refs Sponsored in part by State of California
(PB83-130971; ATR-82-(7884)-TR-1-Vol-2; ARB-R-82/169-Vol-2) Avail: NTIS HC A09/MF A01 CSCL 13B

The costs and performance potential were assessed for the simultaneous use of NOx control systems applied in various combinations and at various control levels on 11 stationary sources. NOx control systems studied included combinations of low NOx burners, selective noncatalytic reduction, and selective catalytic reduction. The stationary sources, totalling 11 different installations, include refinery process heaters and industrial boilers of various sizes and types, a carbon monoxide boiler, and a glass melting furnace. Primary emphasis was on NOx reduction costs and corresponding applicability of various control strategies as applied to major emission sources for a range of sizes and equipment operating conditions. It was concluded that generally the applicability of a combination of NOx controls is feasible, but the cost effectiveness is unique for each unit examined. Author (GRA)

**N83-23983#** Environmental Protection Agency, Research Triangle Park, N.C. Office of Quality Planning and Standards.
**CONTROL TECHNIQUES FOR PARTICULATE EMISSIONS FROM STATIONARY SOURCES, VOLUME 1 Final Report**
Sep. 1982 459 p refs
(PB83-127498; EPA-450/3-81-005A-Vol-1) Avail: NTIS HC A20/MF A01 CSCL 13B

Available data on characterization; sampling methods and analytical techniques for particulate emissions are given. Particle behavior and characteristics; types of particulate control systems, their operating principles, design, operation, and maintenance are discussed. Costs and environmental consideration of particulate control techniques; and emerging technologies for particulate removal systems are discussed. Information to quantify particulate removal efficiencies by particulate size for the differing types of particulate removal systems is given. GRA

**N83-23984#** Environmental Protection Agency, Research Triangle Park, N.C. Office of Air Quality Planning and Standards.
**CONTROL TECHNIQUES FOR PARTICULATE EMISSIONS FROM STATIONARY SOURCES, VOLUME 2 Final Report**
Sep. 1982 670 p refs
(PB83-127480; EPA-450/3-81-005B-Vol-2) Avail: NTIS HC A99/MF A01 CSCL 13B

Information on major sources of particulate emissions are given and techniques used to control emissions from these sources are discussed. Particulate size data for uncontrolled and controlled sources are included for many sources. Additionally, industrial process fugitive emission data and fugitive emission data are presented for some emission sources. GRA

# 46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation.*

**N83-23985** Institut d'Aeronomie Spatiale de Belgique, Brussels.
**SOLAR VARIABILITY AND MINOR CONSTITUENTS IN THE LOWER THERMOSPHERE AND IN THE MESOSPHERE**
G. Brasseur, P. deBaets, and A. deRudder 1982 24 p refs Presented at SCOSTEP Meeting, Ottawa, May 1982
(Aeronomica-Acta-A-251-1982) Avail: Issuing Activity

The variation in the solar irradiance related to the 11 year cycle leads to changes in the photodissociation and photoionization of the upper and middle atmosphere. The strength of the particle precipitation is also modified. These phenomena are responsible for cyclic variations in the concentration of water vapor, nitric oxide, atomic oxygen, ozone and of ionic compounds in the E and D-region. The effects were simulated by a zonally averaged two dimensional model while considering the latitudinal and the seasonal dependences. The increase of thermospheric nitric oxide with solar activity, the corresponding enhancement of the downward flux of NO reaching the stratosphere during the winter and the impact of this effect on the photoionization are considered. E.A.K.

**N83-23986** Institut d'Aeronomie Spatiale de Belgique, Brussels.
**THE OBLATENESS EFFECT ON THE EXTRATERRESTRIAL SOLAR RADIATION**
E. vanHemerlrijck 1982 26 p refs Submitted for publication
(Aeronomica-Acta-A-249-1982) Avail: Issuing Activity

Calculations of the daily solar radiation incident in high Earth atmosphere, with and without the effect of the oblateness, are presented. It is shown that in summer the daily insolation of an oblate Earth is slightly increased in two regions symmetric to the summer solstice. In winter, the flattening effect results in a more extensive polar region, the solar energy input is always reduced when compared to a spherical one. The mean daily solar radiation was numerically analyzed. It is found that the mean summer daily insolation is scarcely increased between the equator and the subsolar point, but decreased poleward of the above mentioned limit. In winter, however, the mean daily insolation is always reduced, the maximum loss of insolation attaining as much as 1% in the 55-58 deg latitude interval. The partial gain of the mean summertime insolation is much smaller than the reduction during winter season evidently yields a mean annual daily insolation which is decreased. E.A.K.

**N83-23987** Institut d'Aeronomie Spatiale de Belgique, Brussels.
**SOLAR VARIABILITY AND MINOR CONSTITUENTS IN THE LOWER THERMOSPHERE AND IN THE MESOSPHERE**
G. Brasseur, P. deBaets, and A. deRudder 1982 24 p refs Presented at SCOSTEP Meeting, Ottawa, May 1982
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**N83-23988** Institut d'Aeronomie Spatiale de Belgique, Brussels.
**ON THE RELEVANCE OF THE MHD APPROACH TO STUDY THE KELVIN-HELMHOLTZ INSTABILITY OF THE TERRESTRIAL MAGNETOPAUSE**
M. Roth 1982 20 p refs Submitted for publication
(Aeronomica-Acta-A-253-1982) Avail: Issuing Activity

The usual MHD approximation is not suitable for the description of the Kelvin-Helmholtz instability of the terrestrial magnetopause. A description implies an ideal magnetopause with a smooth continuous variation of the plasma and field parameters which occurs in an extended current sheet. The actual magnetopause and its adjacent plasma boundary layer are highly irregular, both spatially and temporally. It is found that finite ion Larmor radius effects do not represent small corrections. It is argued that these small scale inhomogeneities can change drastically the usual large scale description of the magnetopause oscillations. E.A.K.

**N83-23989*#** Drexel Univ., Philadelphia, Pa. Dept. of Chemistry.

**OPTIMAL PREPARATION OF THE ECC OZONESONDE Final Report, Jul. 1979 - Dec. 1982**

Donald C. Thornton Dec. 1982 12 p refs

(Grant NsG-6035)

(NASA-CR-170301; NAS 1.26:170301) Avail: NTIS HC A02/MF A01 CSCL 04A

The ECC background current was identified as the removal of residual tri-iodide (iodine) as the cell approaches equilibrium. The altitude dependence of this source of the background current is expected to be only slowly changed in the troposphere with a more rapid decrease in the stratosphere. Oxygen does not play a role in the background current except in the unlikely situation where the electrodes have had all forms of iodine removed from them and the electrodes have not re-equilibrated with the sonde solutions before use. A solution mass transport parameter in the ECC was identified and its altitude dependonce determined. The mass transport of tri-iodide dominates in the chemical transduction of ozone to electrical signal. The effect of the mass transport on the ECC background current is predicted. An electrochemical model of the ECC has been developed to predict the response of the ECC to various ozone vertical profiles. The model corresponds very closely to the performance of the ECC in the laboratory. Based on this model, an ECC with no background current is predicted to give total ozone values within 1% of the correct value, although the vertical profile may be in error by as much as + or - 15%. Author

**N83-23990#** Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

**INCOMING SOLAR RADIATION ESTIMATES AT TERRESTRIAL SURFACE USING METEOROLOGICAL SATELLITE**

Nelson Arai and Fausto Carlos deAlmeida Nov. 1982 11 p refs In PORTUGUESE; ENGLISH summary Presented at the 2nd Brazil. Meterol. Congr., Pelotas, 1982

(INPE-2567-PRE/215) Avail: NTIS HC A02/MF A01

Digital images of the visible channel of the GOES5 meteorlogical satellite, and a simple radiative transfer model of the Earth's atmosphere were used to estimate the incoming solar radiation reaching ground. A model which incorporates the effects of Rayleigh scattering and water vapor absorption, the latter parameterized using the surface dew point temperature value, is used. Pyranometer observations, and parameterization versus radiosonde water vapor absorption calculation are compared. E.A.K.

**N83-23991#** Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

**A SIMPLIFIED MODEL OF PLANETARY BOUNDARY LAYER**

Sergio Henrique Franchito and Yoshihiro Yamazaki Nov. 1982 22 p refs In PORTUGUESE; ENGLISH summary Presented at the 2nd Brazil. Meteorol. Congr., Pelotas, 18-22 Oct. 1982

(INPE-2588-PRE/236) Avail: NTIS HC A02/MF A01

The possibility of incorporating the planetary boundary layer (PBL) in complex models, which requires a special treatment was explored. In a simplified version of PBL, the ground substratum is modelled as in Blackadar and the surface layer is accounted for by the Monin-Obukhov similarity theory. The heat and momentun exchanges in the PBL are accomplished through the Richardson number adjustment scheme. The model's ability to present the details of the physical processes involved in the PBL is analyzed. E.A.K.

**N83-23992#** Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

**POTENTIAL OF INPE/CNPQ IN THE ACQUISITION AND TREATMENT OF GEOLOGICAL AND GEOPHYSICAL DATA [POTENCIAL DO INPE/CNPQ EM AQUISICAO E TRATAMENTO DE DADOS GEOLOGICOS E GEOFISICOS]**

Icaro Vitorello and Celso deRennaeSouza Nov. 1982 19 p refs In PORTUGUESE; ENGLISH summary Presented at the Seminar on the Acquisition and Processing of Seismic Data for Petroleum Prospecting, Salvador, 16-17 Aug. 1982

(INPE-2589-PRE/237) Avail: NTIS HC A02/MF A01

Recognition of morphological structures that are indicated by drainage patterns and lineaments obtained from several remote sensing data, with the objective of optimizing geophysical surveys directed at the identification of possible hydrocarbon trapping structures; and computer processing techniques developed for the treatment and graphic presentation of data, visual enhancement of satellite data, atmospheric correction, automatic border detection are presented. Author

**N83-23993#** Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

**CASE STUDY OF CORRECTIVE ACTIVITY ASSOCIATED WITH INSTABILITY LINES IN SOUTHERN AND SOUTHEASTERN BRAZIL**

Iracema F. A. Cavalcanti, Nelson J. Ferreira, and Vernon E. Kousky Nov. 1982 22 p refs Presented at the 2nd Brazil. Meteorol. Congr., Pelotas, 1982

(INPE-2574-PRE/222) Avail: NTIS HC A02/MF A01

The intense convective activity generated by instability lines develops along frontal zones in Southern and Southeastern Brazil during winter was studied. Characterization of the synoptic situation and estimation of the precipitation associated with the convective activity, the case of 24-26 June 1980 is presented. Organized convective activity occurred in association with a cold front that moved Northeastward over Southern Brazil. The evolution of this activity was studied with satellite imagery. Precipitation was estimated by enhancing infrared imagery. The advection of cyclonic vorticity seems to have been an important factor in the development and organization of the cumulonimbi. Mesoscale pressure variations indicate the possible existence of inertial gravity waves. E.A.K.

**N83-23994#** Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

**THE EARTH'S MAGNETIC FIELD IN THE PAST**

Daniel Jean Roger Nordemann Nov. 1982 24 p refs In PORTUGUESE; ENGLISH summary Submitted for publication Sponsored in part by National Fund for Scientific and Technological Development

(INPE-2601-PRE/247) Avail: NTIS HC A02/MF A01

Variations of the Earth's magnetic field in the past are known because they were recorded in various ferrimagnetic minerals such as titanomagnetite and maghemite. This article describes the principal techniques and sample materials (volcanic lava, sediments, etc.) used for paleomagnetic measurements. Author

**N83-23995#** Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

**DENSITY AND MAGNETIC SUSCEPTIBILITY OF PRECAMBRIAN ROCKS IN SOUTHEASTERN BRAZIL [DENSIDADE E SUSCETIBILIDADE MAGNETICA DE ROCHAS PRECAMBRIANAS DO SE DO BRASIL]**

Antonio Padilha Padilha Jan. 1983 16 p refs In PORTUGUESE; ENGLISH summary Submitted for publication

(INPE-2618-PRE/254) Avail: NTIS HC A02/MF A01

Density and magnetic susceptibility measurements of different rocks from SE Brazil were done with the aim to estimate some physical properties of the main rock formations of this area. Although the results could be affected in some regions by insufficient sampling, the measured density values agree with those published from several shield regions in the world. The mean rock densities range from 2.67 to 2.74 g/cu cm for the upper crust and from 2.8 to 2.9 g/cu cm for the lower crust. The

magnetic susceptibility measurements present a wide variation interval for all rocks, but it is possible to separate two groups of regions with different mean susceptibility values, mainly for granitic rocks. Author

**N83-23996#** Instituto de Pesquisas Espaciais, Sao Paulo (Brazil).
**EFFECTS OF MAGNETIC STORMS IN THE F REGION ON THE BRAZILIAN EQUATORIAL IONOSPHERE [EFEITOS DAS TEMPESTADES MAGNETICAS NA REGIAO F DA IONOSFERA EQUATORIAL NO BRASIL]**
Eurico RodriguesdePaula, M. A. Abdu, and I. J. Kantor Dec. 1982 24 p refs Presented at the 34th Ann. Renunion of the SBPC Sponsored in part by the National Fund for Scientific and Technological Development
(INPE-2610-PRE/252) Avail: NTIS HC A02/MF A01

An analysis was carried out of the F-layer peak electron density (foF2) and the height (hpF2) reduced from ionograms over Fortaleza during a number of moderate and severe magnetic storms during the year of 1978. The deduced features of the electron density response are: (1) during the main phase of a moderate magnetic storm, or generally during the fluctuations in the magnetic field H, foF2 increases with respect to the quiet time; (2) the recovery phases of moderate storms are generally characterized by a decrease in the electron density. However, the onset of this negative phase appears to be delayed somewhat compared to the behavior over the low latitude station of Cachoeira Paulista; (3) during very severe storms, the negative response in the electron density is observed even during the main phase of the storms, with not defined response present during the recovery phase of these storms; (4) no well defined characteristics in the F-layer height is identified, except in rare occasions when it shows inverse variations with electron density changes. Author

**N83-23997#** Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
**HOUGH FUNCTIONS: THEORY AND UTILIZATION**
Jose Paulo Bonatti, Pedro Leite da S. Dias (Sao Paulo Univ., Brazil), and Antonio D. Moura Nov. 1982 20 p refs In PORTUGUESE; ENGLISH summary
(INPE-2578-PRE/226) Avail: NTIS HC A02/MF A01

The horizontal and vertical dependencies of the linearized system of equations over a basic state at rest and with temperature varying only in the vertical are obtained for a primitive equations model. This separation takes into account the numerical scheme used in the vertical and leads to two eigenvalue-eigenfunction problems. The horizontal equations are identical to the linearized shallow water equations. There is a dispersion relation showing a class of slow modes (Rossby waves) and another of fast modes (gravity waves). The energy dispersion of these waves and the reinforcement effect in the energy propagation due to the utilization of discrete zonal wave numbers are discussed. Knowing the dispersion properties of these modes and the initial energy spectrum, one is able to predict and understand better the role of the waves in temporal evolution of a given initial field. The Hough functions is utilized as a basis for spectral models as well as their application in the atmospheric tidal problem. Author

**N83-23998#** Cologne Univ. (West Germany). Inst. fuer Geophysik und Meteorologie.
**INVESTIGATION OF SOLAR-TERRESTRIAL RELATIONS IN THE STRATOSPHERE AND TROPOSPHERE [UNTERSUCHUNG VON SOLAR-TERRESTRISCHEN BEZIEHUNGEN IN DER STRATO- UND TROPOSPHAERE]**
B. Schwister 1982 115 p refs In GERMAN
(Contracts DFG-EB-56/5; DFG-EB-56/7-2)
(Mitt-34; ISSN-0069-5882) Avail: NTIS HC A06/MF A01

The relationship between solar activity and change in atmospheric conditions in the lower atmosphere was investigated. The solar-weather relationship was studied however, the generally accepted physical explanation of the occurrence of solar activity effects in the middle and lower atmosphere is not proven. The results of solar terrestrial relations in the upper atmosphere is examined statistically. The dynamic reactive effect of the middle atmosphere on the troposphere is discussed. It is found that the atmospheric vorticity increases significantly 3 to 4 days after the beginning of a geomagnetic storm. It is also shown that the vorticity area index (VAI) decreases statistically shortly after passing a sectorial line of the interplanetary solar magnetic field. It is found that planetary sources carry over the solar activity effects which originate in the middle atmosphere into the lower atmosphere.
Transl. by E.A.K.

**N83-23999#** Institute of Geological Sciences, London (England).
**MAGNETIC RESULTS, 1980: ESKDALEMUIR, HARTLAND AND LERWICK OBSERVATORIES**
1983 73 p refs
(Geomagnetic-Bull-13; ISBN-0-11-884341-9) Avail: NTIS HC A04/MF A01; HMSO £ 6.50 PHI

Magnetic flux data from the observatories at Eskdalemuir, Hartland, and Lerwick for 1980 is provided. B.G.

**N83-24000#** Technische Univ., Vienna (Austria). Studienrichtung Vermessungswesen.
**THE HEIGHT OF THE GROSSGLOCKNER. REPORT ON INVESTIGATIONS TO DETERMINE HEIGHT OF THE GROSSGLOCKNER BY THE INSTITUTE OF GEOLOGY, WEST GERMANY [DIE HOEHE DES GROSSGLOCKNERS. BERICHT VEBER ARBEITEN DES INTSTITUES FUER ALLGEMEINE GEODAESIE ZUR HOEHENBESTIMMUNG DES GROSSGLOCKNERS]**
Friedrich Hauer 1981 67 p refs In GERMAN Sponsored by Bundesministerium fuer Wissenschaft und Forschung Original contains color illustrations
(Geowiss-Mitt-18) Avail: NTIS HC A04/MF A01

The shape and height of the top of the Grossglockner mountain, which is the highest mountain top of the Austrian Alps, was surveyed geodetically. The glaceology of the Grossglockner consisting of the geosciences of: geography, geology, geophysics, geodesy, was studied. The geodetic survey includes preparation of geometric optics. Its changes over time as a basis for more extensive geoscientific investigations are outlined. The 1955 and 1979 expeditions are reported. Transl. by E.A.K.

**N83-24001#** Max-Planck-Institut fuer Radioastronomie, Bonn (West Germany).
**EVALUATION OF RADIO ASTRONOMICALLY IMPORTANT TROPOSPHERIC PARAMETERS FOR EFFELSBERG FROM RADIOSONDE DATA**
N. C. Mathur (Indian Inst. of Technology) Aug. 1981 34 p refs (TR-58) Avail: NTIS HC A03/MF A01

Tropospheric parameters can be measured by radiosondes (RS), microwave radiometers (MR), and infrared spectral hygrometers (IRSH). A four-frequency microwave radiometer was installed on the prime focus of the Effelsberg telescope. It is undergoing tests and calibration. The estimation of various effects from radiosonde data are considered. The effects considered are the phase pathlength L, the integrated water vapor V, the extinction tau, the brightness temperature T, and the refraction N due to the troposphere. The frequency dependent effects (tau and T) are evaluated for the four radiometer frequencies (21.5, 22.2, 22.9, and 23.6 GHz) and for some of the observational frequencies (correponding to wavelengths of 11 cm, 6 cm, 2.8 cm, and 0.7 cm). The radiosonde data used as the basis of this analysis is described. S.L.

**N83-24002#** Niedersaechsisches Landesamt fuer Bodenforschung, Hannover (West Germany).
**DEVELOPMENT OF A QUANTITATIVE METHOD FOR THE EVALUATION OF dc RESISTIVITY MEASUREMENTS MADE IN THE COURSE OF PROSPECTING FOR MINERAL RESOURCES, ASSUMING AN ARBITRARY RESISTIVITY DISTRIBUTION IN THE SUBSURFACE (DEPTH OF INVESTIGATION: 500 M) Final Report, Dec. 1981**
Erich Mundry and Ruediger Schulz Bonn Bundesministerium fuer Forschung und Technologie Dec. 1982 49 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer

Forschung und Technologie
(BMFT-FB-T-82-239; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 10,50

Direct current resistivity soundings for a quantitative interpretation were carried out mainly for horizontally layered grounds. The following activities were undertaken: (1) geometrically simple bodies to test the possibilities of resistivity measurements, were calculated; (2) methods were developed for calculation of geoelectrical model curves, for 2D resistivity distribution using the method of finite differences; (3) a field truck was equipped with instruments for acquisition and storage of geoelectrical field data; (4) measurements were carried out in a model tank; (5) field measurements with corresponding interpretations were made above graphite occurrences in the Bavarian Forest; and (6) a computer file with geoelectrical field data was established. The apparatus for data acquisition and storage is used in routine work; and the methods and programs are in use for the exploration of non stratabound deposits. E.A.K.

**N83-24003#** Centre de Recherches en Physique de l'Environnement, Issy-les-Moulineaux (France).
**VERTICAL VELOCITY FIELD AND CONVECTIVE PLUMES IN THE ATMOSPHERIC BOUNDARY LAYER AS OBSERVED WITH AN ACOUSTIC DOPPLER SODAR**
Odile Taconet and Alain Weill Mar. 1981 77 p refs
(CRPE-NT-98) Avail: NTIS HC A05/MF A01

The vertical velocity field and the convective plumes which are observed during the morning with the acoustic Doppler sounder are examined. Two points of view are presented: (1) microscopically the histogram of vertical velocity in the well mixed layer associated with conditional averaging shows the relations between the vertical velocity skewness and the convective velocity and gives an objective criterium for plume determination; (2) microscopically the predictions of the models and the plumes properties as observed by the Doppler Sodar are compared microscopically. It is shown that the convective plumes observed carry near 60% of the sensible heat flux at the top of the surface layer. E.A.K.

**N83-24004#** Centre de Recherches en Physique de l'Environnement, Issy-les-Moulineaux (France).
**ON THE CONTROL OF MAGNETOSPHERIC CONVECTION BY THE SPATIAL DISTRIBUTION OF IONOSPHERIC CONDUCTIVITIES**
C. Senior and M. Blanc Dec. 1982 96 p refs Submitted for publication
(CRPE-NT-123) Avail: NTIS HC A05/MF A01

A self-consistent semianalytical model of magnetospheric convection which includes the effect of the latitude and local time variations of ionospheric conductivities is presented. The motions of the inner edge of the magnetospheric ring current, and the associated field aligned currents, produced by the externally imposed dawn to dusk potential drop across the magnetospheric cavity are computed by a linear approximation. The coupling between the different diurnal harmonics in the local time variations of fields and currents produced by the local time dependence of ionospheric conductivities is described. It is shown that the enhancement of auroral conductivities by electron precipitation in the auroral zone significantly enhances both the typical duration and the absolute amplitude of the penetration of convection electric fields to mid latitudes. The concept of the shielding of midlatitudes from the convection electric fields is confirmed. The large subauroral electric fields observed by several satellites are also reproduced in the model either by a decrease of the subauroral conductivities below the midlatitude values, or by the consideration of a very narrow latitudinal extent of the aurora zone. It is shown that a large class of phenomena related to magnetospheric convection in the dipole regions of the magnetosphere can be described by a linear theory. E.A.K.

**N83-24005#** International Meteorological Inst., Stockholm (Sweden).
**RESIDENCE TIME AND SPATIAL VARIABILITY FOR GASES IN THE ATMOSPHERE**
Mats Hamrud 18 Nov. 1982 27 p refs
(Contract NFR-G-GU-3922-104)
(CM-60; ISSN-0280-445X) Avail: NTIS HC A03/MF A01

The relation between spatial variability and residence times for gases in the atmosphere was studied by a two dimensional numerical model. It is indicated that the residence time shows a strong dependence on the variability of the sources, plays an important role. The situation is improved if the source location is indicated. The general features of increasing residence time with decreasing variability and a strong dependence on the source configuration are confirmed. E.A.K.

**N83-24006*#** Uppsala Ionospheric Observatory (Sweden).
**AN OBSERVATION OF LHR NOISE WITH BANDED STRUCTURE BY THE SOUNDING ROCKET S29 BARIUM-GEOS**
Hannu E. J. Koskinen, Gunnar Holmgren, and Paul M. Kintner (Cornell Univ., Ithaca, N.Y.) Nov. 1982 22 p refs Submitted for publication Sponsored by Swedish Board of Space Activities
(Contracts NA65-60; N000-14-81-K-0018)
(UIO-SR-82-03; ISSN-0349-2699) Avail: NTIS HC A02/MF A01

The measurement of electrostatic and obviously locally produced noise near the lower hybrid frequency made by the sounding rocket S29 Barium-GEOS is reported. The noise is strongly related to the spin of the rocket and reaches well below the local lower hybrid resonance frequency. Above the altitude of 300 km the noise shows banded structure roughly organized by the hydrogen cyclotron frequency. Simultaneously with the banded structure, a signal near the hydrogen cyclotron frequency is detected. This signal is also spin related. The characteristics of the noise suggest that it is locally generated by the rocket payload disturbing the plasma. If this interpretation is correct we expect plasma wave experiments on other spacecrafts, e.g., the space shuttle to observe similar phenomena. S.L.

**N83-24007#** Research Inst. of National Defence, Stockholm (Sweden).
**RESEARCH ON SWEDISH EARTHQUAKES Final Report, Dec. 1979 - Dec. 1981**
Ragnar Slunga Nov. 1982 190 p refs Sponsored by Nuclear Power Inspectorate
(FOA-C-204771-T1) Avail: NTIS HC A09/MF A01

Earthquakes in Sweden, recorded from Dec. 1979 to 1981 by the digital seismic network in Southern Sweden are reported. A method based on both first motion polarities and spectral amplitudes is presented. The fault plane solution and the seismic moment and corner frequencies, fault dimensions, stress drops and peak slip displacements are determined for 53 Swedish earthquakes. Epicentral ground motion is studied and a relation for a two parametric scaling of the earthquakes is applied to the bedrock peak accelerations. An NW-SE horizontal compression is indicated by the source mechanisms. Quite often surface topographic lineaments are consistent with the fault plane solutions. The frequency, epicentral and depth distribution and peak accelerations are in agreement with previous studies on seismic risk. E.A.K.

**N83-24008#** Naval Research Lab., Washington, D. C. Geophysical and Plasma Dynamics Branch.
**THE MORPHOLOGY OF A MULTI-BUBBLE SYSTEM IN THE IONOSPHERE Interim Report**
J. Chen, P. Satyanarayana, and S. L. Ossakow 11 Jan. 1983 40 p refs
(RR0330244)
(AD-A123065; NRL-MR-5007) Avail: NTIS HC A03/MF A01 CSCL 04/1

A multi-bubble model is developed to study the morphology of a finite array of plasma density depletions (bubbles) in the context of equatorial F-region irregularities during spread F. The Pedersen current conservation equation with quasi-neutrality is solved analytically using an electrostatic analogy. The solution is exact with no a priori assumption regarding the separation distance. A two-bubble system with a piecewise constant density profile is first analyzed and the technique is then applied to multi-bubble

systems to calculate the polarization electric field and the rise velocities. It is shown that the influence of the neighboring bubbles is relatively short-ranged and that a small number of bubbles can adequately model the essential physics in a large array of bubbles. For moderately short separation distances, it is found that the E x B rise velocity is substantially reduced in comparisen with the single-bubble case and that the rise velocity is strongly sheared resulting in the deformation of the countours. The implications of the new morphological results on the stability and dynamical behavior of the bubbles are discussed. The analysis can also be applied to a multi-plasma density enhancement (striation fingers and plasma clouds) system such as one might encounter in plasma cloud striation fingers. Author (GRA)

**N83-24009#** Science Applications, Inc., La Jolla, Calif. Electronic Vision Systems Div.

**SATELLITE MEASUREMENTS OF ATMOSPHERIC AEROSOLS Annual Report, 1 Oct. 1981 - 30 Nov. 1982**

M. Griggs 22 Dec. 1982 20 p refs
(Contracts N00014-77-C-0489; NOAA-MO-A01-78-00-4092)
(AD-A123072; SAI-131-82-343LJ) Avail: NTIS HC A02/MF A01 CSCL 20/1

Analysis of NOAA-6 AVHRR data and ground truth measurements at Midway show excellent agreement between the satellite inferred values of aerosol optical thickness and the ground truth values. Similar agreement was found previously at San Diego and on the USNS Hayes in the Atlantic Ocean, suggesting that the satellite technique for measuring tropospheric aerosols has global application. Author (GRA)

**N83-24010#** Naval Research Lab., Washington, D. C.

**A PHOTOELECTRIC MODEL FOR THE RAPID COMPUTATION OF ATMOSPHERIC EXCITATION RATES**

D. J. Strickland and R. R. Meier 30 Dec. 1982 42 p refs
(AD-A122871; NRL-MR-5004) Avail: NTIS HC A03/MF A01 CSCL 07/4

This report describes a model for excitation and ionization in the daytime ionosphere. The model was developed to study optical emissions under a variety of conditions. The needed photoelectron flux is calculated using an integral equation which provides for a detailed energy loss description but does not include transport effects. Currently, the calculated flux is used to specify altitude profiles of volume excitation rates for approximately 50 processes. GRA

**N83-24011#** California State Univ., Long Beach. Dept. of Geological Sciences.

**REPETITIVE PRECISION GRAVITY STUDIES AT THE CERRO PRIETO AND HEBER GEOTHERMAL FIELDS**

Roswitha B. Grannell Sep. 1982 104 p refs Sponsored in part by the Mexican Comision Federal de Electricidad
(Contract DE-AC03-76SF-00098)
(DE83-004467; LBL-15073) Avail: NTIS HC A06/MF A01

To study subsidence and mass removal, a precise gravity network was established on 60 permanent monuments in the Cerro Prieto geothermal field in early 1978, and repeated annually through early 1981; the survey was tied to two bedrock sites outside the limits of the current production zone. The looping technique of station occupation was utilized, in which occupation of the base was followed by occupation of several stations, followed by a return to the base. Use of two LaCoste and Romberg gravity meters, and replication of values within loops as well as entire loops, enhanced precision such that the median standard deviations of the base-to-station differences, reduced to observed gravity values, ranged from 7 to 15 microgals for individual surveys. The smaller values were obtained as field and data reduction techniques were improved and experience was gained. A similar survey was initiated in the Heber area just north of the Mexican border in early 1980. It too was established on permanent monuments, was tied to bedrock stations outside the geothermal area, and used multiple repetitions of values with two meters to achieve high precision. DOE

**N83-24012#** Utah Univ., Salt Lake City. Dept. of Geology and Geophysics.

**MODEL FOR THE CROSSCOUPLING PARAMETERS OF ROCKS**

W. R. Sill Jun. 1982 32 p refs
(Contract DE-AC07-79ID-12079)
(DE82-019922; DOE/ID-12079/69) Avail: NTIS HC A03/MF A01

The self-potential method of geothermal exploration is based on the measurement of naturally occurring electrical potentials generated by flows of fluid (electrokinetic) and heat (thermoelectric) through rocks. The interpretation of self-potential measurements by modeling requires a knowledge of crosscoupling parameters of geological materials. A model for estimating crosscoupling parameters was developed. This model is based on theoretical considerations of crosscoupling in capillaries and on some experimental data. This model is useful as a guide to the modeler/interpreter in estimating the gross crosscoupling parameters. However, its usefulness could be greatly increased if it can be verified that it is capable of accurately predicting crosscoupling effects from more basic data on rocks. Comparison of the model to existing experimental measurements of crosscoupling parameters is limited by the quality of the data and the lack of knowledge of other parameters crucial to the model. DOE

**N83-24013#** Utah Univ., Salt Lake City. Dept. of Geology and Geophysics.

**HYDROGEN AND OXYGEN ISOTOPE GEOCHEMISTRY OF COLD AND WARM SPRINGS FROM THE TUSCARORA, NEVADA THERMAL AREA**

J. R. Bowman and D. Cole Jun. 1982 24 p refs
(Contract DE-AC07-79ID-12079)
(DE82-019920; DOE/ID-12079/70) Avail: NTIS HC A02/MF A01

Eighteen cold and warm spring water samples from the Tuscarora, Nevada KGRA were analyzed for hydrogen and oxygen isotope composition and fluid chemistry. The recharge area for the warm springs is unlikely to be to the immediate north, which is the local topographic highland in the area. The hydrogen isotope data permit recharge from areas to the southwest or from high elevations to the southeast (Independence Mountains), a sector consistent with electrical resistivity evidence of fluid floow. The warm springs exhibit poor correlations between either hydrogen or oxygen isotope composition and water temperature or chemistry. It is suggested that because of the absence of such correlations, there is no single coherent pattern of cold water mixing or evaporation in the thermal spring system. DOE

**N83-24014#** Utah Univ., Salt Lake City. Earth Science Lab.

**ELECTROMAGNETIC MODELING OF 3-DIMENSIONAL BODIES IN LAYERED EARTHS USING INTEGRAL EQUATIONS**

Philip E. Wannamaker and Gerald W. Hohmann Jan. 1982 57 p refs
(Contract DE-AC07-79ID-12079)
(DE82-019907; DOE/ID-12079/50; ESL-64) Avail: NTIS HC A04/MF A01

An algorithm based on the method of integral equations was developed to simulate the electromagnetic response of 3-D bodies in layered earths. The inhomogeneities are replaced mathematically by an equivalent current distribution which is approximated by pulse basis functions. A matrix equation is constructed using the electric dyadic Green's function appropriate to a layered earth and is solved for the vector current in each cell. Scattered fields are found by integrating electric and magnetic dyadic Green's functions over the scattering currents. It is found that tabulation/interpolation of the six electric and five magnetic Hankel transforms defining the secondary Green's functions is preferable to any direct Hankel transform calculation using linear filters. DOE

**N83-24015#** Utah Univ., Salt Lake City. Dept. of Geology and Geophysics.

**OXYGEN-ISOTOPE GEOCHEMISTRY OF QUATERNARY RHYOLITE FROM THE MINERAL MOUNTAINS**

J. R. Bowman, S. H. Evans, Jr., and W. P. Nash Mar. 1982 25 p refs
(Contract DE-AC07-79ID-12079)
(DE82-019951; DOE/ID-12079/61) Avail: NTIS HC A02/MF A01

Oxygen isotope analyses were made of phenocryst and glass separates from four Quaternary rhyolite flows and domes in the Mineral Mountains, southwest Utah. With the exception of biotite in all samples and alkali feldspar in the rhyolite domes, all minerals appear to be in close oxygen isotope exchange equilibrium. The geothermometry equations proposed by Bottinga and Javoy (1973) and Javoy (1977) for quartz, alkali feldspar and magnetite produce the best agreement with temperature results from two-feldspar and iron-titanium oxide geothermometry for these rhyolites. If the rhyolites were generated by partial melting in the crust, their wholerock (glass) Delta 018 values (6.3 to 6.9 permil) are consistent with generation from I-type sources. DOE

**N83-24016#** Utah Univ., Salt Lake City.
**INTERPRETATION OF GEOPHYSICAL DATA FROM THE COLADO KGRA, PERSHING COUNTY, NEVADA**
Claron E. Mackelprang Apr. 1982 91 p refs
(Contract DE-AC07-79ID-12079)
(DE82-019937; DOE/ID-12079/58; ESL-71) Avail: NTIS HC A05/MF A01

The Colado geothermal area is evidenced by hot water wells in alluvium along the west flank of the West Humboldt Range. The exploration of this geothermal system has progressed into advanced stages with completion of shallow thermal gradient drilling, two intermediate depth exploration drill holes, one deep exploration drill hole, detailed geologic mapping, dipole-dipole resistivity, gravity, ground magnetics. MT-AMT, TDEM and assorted uncommon electrical resisitivity techniques. A thermal anomaly was outlined by the shallow drilling. Dipole-dipole resistivity and gravity data along with detailed geologic mapping have suggested that this anomaly is structurally controlled. Other geophysical techniques employed do not appear to contribute to an understanding of the geothermal anomaly. The two intermediate depth exploration holes (IGH-1, IGH-2) and the one deep hole (44x-10) were not located in the most favorable portions of the geothermal anomaly. DOE

**N83-24017#** Utah Univ., Salt Lake City. Earth Science Laboratory Div.
**TWO-DIMENSIONAL MODELING RESULTS OF TELLURIC-MAGNETOTELLURIC DATA FROM THE TUSCARORA AREA, ELKO COUNTY, NEVADA**
Claron E. Mackelprang Jan. 1982 29 p refs
(Contract DE-AC07-79ID-12079)
(DE82-019927; DOE/ID-12079/48; ESL-63) Avail: NTIS HC A03/MF A01

Two dimensional modeling of telluric-magnetotelluric (T-MT) data taken at the Tuscarora Geothermal Exploration unit has shown that in this area the TM-Mode is insensitive in resolving conductivity in homogeneities below a depth of about 2 km. Computer interpretive models showing a large conductive zone beneath the hot spring area at a depth of 2 km are compared with models in which this conductive zone is restricted to the near surface. Acceptable fits between observed apparent resistivity and calculated resistivity, within the accuracy of the field data, also were obtained with alternate models. This non-uniqueness is inherent in the two dimensional models themselves and is further complicated by the geologic setting where three dimensional effects result from near surface conductive bodies. Current channeling within the conductive sediments of Independence Valley may also limit the ability to resolve postulated deep conductivity inhomogeneities. DOE

**N83-24018#** Sandia Labs., Albuquerque, N. Mex.
**SANDIA TECHNOLOGY**
H. M. Willis, ed., A. D. Thornborough, ed., C. E. Cocklereas, ed., A. J. Trennel, ed., G. F. Hoenstreter, ed., and P. L. Mead, ed. May 1982 33 p
(Contract DE-AC04-76DP-0079)
(DE82-014270; SAND-82-0221-Vol-6-No-1) Avail: NTIS HC A03/MF A01

Some of Sandia's activities and accomplishments in unclassified programs are described in this report. The role of Sandia in research and development for the Strategic Petroleum Reserve (SPR) is discussed. They are responsible for establishing testing, certification, and monitoring procedures for, and predicting the long-term behavior of, the stored petroleum. Studies in simulated Raman spectroscopy are also discussed. Its use in the study of combustion processes and chemical vapor deposition is described. DOE

**N83-24019#** Department of Energy, Bartlesville, Okla. Energy Technology Center.
**AUTOMATED SYSTEM FOR PERMEABILITY AND ELECTRICAL CONDUCTIVITY OF LOW-PERMEABILITY RESERVOIR ROCK**
J. B. Jennings, C. J. Raible, and H. B. Carroll, Jr. Jul. 1982 22 p refs
(DE82-020150; DOE/BETC/RI-82/6) Avail: NTIS HC A02/MF A01

An automated laboratory control and measurement system for liquid permeability and electrical conductivity of low permeability reservoir rock as a function of confining pressure has been contructed and tested. The system is controlled by a deskton computer with digital I/0, ADC and IEEE-488 interfaces. Computer programs and flow charts are presented for the automated system and for application of portions of the system to other laboratory experiments. DOE

**N83-24020#** Cliffs Minerals, Inc., Rifle, Colo.
**GEOLOGIC ANALYSIS OF DEVONIAN SHALE CORES**
Feb. 1982 247 p refs
(Contract DE-AC21-78MC-08199)
(DE82-015003; DOE/MC-08199/T12) Avail: NTIS HC A11/MF A01

A description is given of the field retrieval and laboratory analysis of cores from the Devonian shales of the following eleven states: Michigan, Illinois, Indiana, Ohio, New York, Pennsylvania, West Virginia, Maryland, Kentucky, Tennessee and Virginia. The purpose was to explore these areas to determine the amount of natural gas being produced from the Devonian shales. The study included LANDSAT information, geochemical research, structural sedimentary and tectonic data. Field retrieval procedures, laboratory procedures, geologic analysis (by state), references, and appendices are given. DOE

**N83-24021#** Terra Tek, Inc., Salt Lake City, Utah.
**A HEATED FLATJACK TEST SERIES TO MEASURE THE THERMOMECHANICAL AND TRANSPORT PROPERTIES OF IN SITU ROCK MASSES (HEATED BLOCK TEST)**
E. Hardin, N. Barton, D. Lingle, M. Board, and M. Voegele Sep. 1982 195 p refs
(Contract DE-AC06-76RL-01830)
(DE83-000728; ONWI-260) Avail: NTIS HC A09/MF A01

An instrumented 8 cu m block of jointed gneiss was subjected to biaxial and uniaxial loading at ambient and elevated temperatures, using flatjacks and a line of borehole heaters. The following rock mass properties were investigated under various conditions of stress (0 to 6.9 MPa, uniaxial and biaxial) and temperature (12 to 74 C mean block temperature): joint permeability, static modulus, dynamic modulus, joint normal and shear stiffness, coefficient of thermal expansion, thermal conductivity and diffusivity. The instrumentation array included multiple position borehole extensometers, DCDT and IRAD surface strainmeters, various borehole stressmeters and deformation gages, numerous thermocouples and Whitemore strain gage measurement points. The coefficient of thermal expansion was found to initially reduce with increasing temperature in the horizontal loaded directions, and to increase in the unloaded vertical direction. DOE

**N83-24022#** Wyoming Univ., Laramie. Dept. of Geology and Geophysics.

**HEAT-FLOW STUDIES IN WYOMING, 1979 TO 1982**
E. R. Decker, H. P. Heasler, and K. L. Buelow Dec. 1981 44 p refs
(Contract DE-FC07-79ID-12026)
(DE82-021739; DOE/ID-12026/T2) Avail: NTIS HC A03/MF A01

Thirty heat flow values completed during May 1981 for Wyoming are tabulated and updated maps of heat flow in Wyoming and adjacent areas are presented. DOE

**N83-24023#** Wyoming Univ., Laramie. Dept. of Geology and Geophysics.
**HEAT FLOW, RADIOACTIVITY, GRAVITY, AND GEOTHERMAL RESOURCES IN NORTHERN COLORADO AND SOUTHERN WYOMING**
E. R. Decker and K. L. Buelow Dec. 1981 27 p refs
(Contract DE-FC07-79ID-12026)
(DE82-020751; DOE/ID-12026/T1) Avail: NTIS HC A03/MF A01

The surface heat flow values in the Sierra Madre-Medicine Bow-Laramie Mountains region are in the range 0.6 to 1.5 HFU. When the heat from local bedrock radioactivity is considered, the reduced flux in these mountains is low to normal. These data and the low to normal gradients in the drill holes suggest that the resource potential of the Southern Rockies in Wyoming is low. The geothermal resource potential of the sedimentary basins in Wyoming that border these mountains also appears to be low. In contrast to southern Wyoming, the high surface and reduced heat flows suggest that the Park areas and other parts of the Southern Rockies in northern Colorado are potentially valuable geothermal resource areas. The narrow northerly borders of these positive anomalies suggest that some of the resources could be shallow, as does the evidence for regional igneous and tectonic activity in the late Cenozoic. DOE

**N83-24024#** Los Alamos Scientific Lab., N. Mex.
**ROCK FAILURE DURING MASSIVE HYDRAULIC STIMULATION OF THE BACA LOCATION GEOTHERMAL RESERVOIR**
Chris Pearson, Hans Keppler, James Albright, and Robert Potter 1982 5 p refs Presented at the Geothermal Resources Council Meeting, San Diego, Calif., 11-14 Oct. 1982
(Contract W-7405-eng-36)
(DE82-018369; LA-UR-81-1578; CONF-821007-5) Avail: NTIS HC A02/MF A01

The analyses of microearthquake signals occurring during hydraulic stimulation provide an estimate of the size and location of the fractures thus produced. Studies of microearthquakes occurring during two large (> 1,000 cu m) hydraulic stimulations of the hydrothermal reservoir at the Baca Location in the Jemez Mountains of northeastern New Mexico are reported. Both stimulations consisted of water, viscosity enhancer, and proppant. The microearthquake event rate was low but variable throughout most of the treatment. Rock failure as indicated by the distribution of the microearthquakes' foci appeared restricted to a nearly vertical NE striking zone. This orientation is in good agreement with the local earth stresses inferred from geological considerations. The second stimulation which occurred in a neighboring well was similar to the first except for a larger injected volume. The lateral extent of the detected fracture system was 600 m in both stimulations. DOE

**N83-24025#** Los Alamos Scientific Lab., N. Mex.
**EVIDENCE OF FORMER HIGHER TEMPERATURES FROM ALTERATION MINERALS, BOSTIC 1-A WELL, MOUNTAIN HOME, IDAHO**
B. Arney 1982 5 p refs Presented at Ann. Geothermal Resources Council Meeting, San Diego, Calif., 11 Oct. 1982
(Contract W-7405-eng-36)
(DE82-0118412; LA-UR-82-1710; CONF-821007-11) Avail: NTIS HC A02/MF A01

Cuttings from the silicic volcanics in the Bostic 1-A well near Mountain Home, Idaho were examined petrographically with the assistance of X-ray diffraction and electron microprobe analyses. Results indicate that these rocks were subjected to much higher temperatures than were observed in the well, when a static temperature log was run. It is not known to what extent the alternation may be due to greater depth of burial in the past, or whether it resulted from an early hydrothermal system of higher temperature than the one observed. DOE

**N83-24026#** California Univ., Livermore. Lawrence Livermore Lab.
**GEOLOGICAL-FRACTURE MAPPING USING ELECTROMAGNETIC GEOTOMOGRAPHY**
A. L. Ramirez, F. J. Deadrick, and R. J. Lytle 29 Jun. 1982 10 p refs Presented at the Rev. of Progr. in Quantitative NDE, San Diego, Calif., 1-6 Aug. 1982
(Contract W-7405-eng-48)
(DE82-019317; UCRL-87785; CONF-820820-1) Avail: NTIS HC A02/MF A01

The evaluation of a new geophysical technique used to map fractures between boreholes is described: electromagnetic geotomography used in conjunction with salt water tracers. An experiment was performed in a granitic rock mass. Geotomographic images were generated and compared with borehole geophysical data: neutron logs, acoustic velocity logs, caliper logs and acoustic televiewer records. Comparisons between the images and the geophysical logs indicate that clusters of fractures were detected but single fractures were not. DOE

**N83-24027#** Kiruna Geophysical Inst. (Sweden).
**ON THE ORIGIN OF THE HOT IONS IN THE DISTURBED DAYSIDE MAGNETOSPHERE**
Bengt Hultqvist Apr. 1982 35 p refs
(PB83-135525; KGI-PREPRINT-056; ISBN-0349-2656) Avail: NTIS HC A03/MF A01 CSCL 04A

The dayside magnetosphere of O+ and H+ ion densities as function of radial distance under fairly undisturbed and under storm conditions were described. It is argued that acceleration of the hot magnetospheric ions of ionospheric origin cannot be limited to the outer parts of the field tubes. The extraction process seems to work below 100 km altitude in storm conditions and to have a fairly small extension in altitude. The acceleration mechanism(s) do not affect only one ion species. Variation in the altitude of the extraction of ionospheric ions is the most likely reason for the observed variations in the n(O+)/n(H+) ratio extraction of ionospheric ions into the magnetosphere are main cause of the storm time density decrease of the ionosphere. GRA

**N83-23800#** Kepling and Associates, Inc., Tulsa, Okla.
**GEOLOGIC INPUT INTO EOR SIMULATION TECHNIQUES WORKSHOP**
*In its* The Impact of Geol. Parameters on Enhanced Oil Recovery May 1982 p 34-40 (For primary document see N83-23794 13-44)
Avail: NTIS HC A03/MF A01

**N83-24141#** National Oceanic and Atmospheric Administration, Silver Spring, Md. Air Resources Labs.
**ATMOSPHERIC CO2 CONCENTRATIONS**
Lester Machta *In* Undersea Medical Society, Inc. Effect of CO2 on Mammalian Organisms Dec. 1982 7 p (For primary document see N83-24139 13-51)
Avail: NTIS HC A06/MF A01

## 47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

**N83-24028*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
**VISSR ATMOSPHERIC SOUNDER (VAS) RESEARCH REVIEW**
James R. Greaves, ed. Washington Mar. 1983 54 p refs Rev. held in Greenbelt, Md., 16-17 Jun. 1982 Original contains color illustrations
(NASA-CP-2253; Rept-83F0188; NAS 1.55:2253) Avail: NTIS

HC A04/MF A01 CSCL 04B

The VAS, an experimental instrument flown onboard Geostationary Operational Environmental Satellite (GOES), is capable of achieving mutlispectral imagery of atmospheric temperature, water vapor, and cloudiness patterns over short time intervals. In addition, this instrument provides an atmospheric sounding capability from geosynchronous orbit. The VAS demonstration is an effort for evaluating the VAS instrument's performance, and for demonstrating the capabilities of a VAS prototype system to provide useful geosynchronous satellite data for supporting weather forecasts and atmospheric research. The demonstration evaluates the performance of the VAS Instruments on GOES-4-5, and -6, develops research oriented and prototype/operational VAS data processing systems, determines the accuracy of certain basic and derived meteorological parameters that can be obtained from the VAS instrument, and assesses the utility of VAS derived information in analyzing severe weather situations. For individual titles, see N83-24029 through N83-24046.

**N83-24029*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

**SYSTEM DESCRIPTION**

Harry Montgomery *In its* VISSR Atmospheric Sounder (VAS) Res. Rev. Mar. 1983 p 1-3 (For primary document see N83-24028 13-47)

Avail: NTIS HC A04/MF A01 CSCL 04B

The VAS, carried onboard the GOES 4 and 5 satellites, is a radiometer with 8 visible channel detectors and 6 thermal detectors that detect infrared radiation in 12 spectral bands. A filter wheel in front of the detector is used to achieve the spectral selection. The spatial resolution is 0.9 kilometer in the visible and 7 or 14 kilometers in the infrared depending on the detector used. Full Earth disk coverage is accomplished by spinning in the west to east direction at 100 rpm and by stepping a scan mirror from north to south. Additional VAS instrument characteristics are summarized. The VAS has three operating modes: the operational VISSR mode, the multispectral imaging (MSI) mode, and the dwell sounding (DS) mode. The operational VISSR mode is used by NOAA/NESS for its operational products, which include a visible picture and an 11 micrometer infrared (channel 8) picture at half hour intervals. The other modes are VAS unique. The MSI mode combines the operational VISSR capability (visible plus infrared window) with two additional spectral channels to provide half hourly full Earth disk imagery of atmospheric water vapor, temperature, and cloud distribution. The DS mode is used primarily for sounding to obtain the temperature and moisture profiles. In this mode, multiple spins on the same scan line in a given band are averaged to obtain the required signal to noise ratio for sounding. S.L.

**N83-24030*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

**LOW-LEVEL WATER VAPOR FIELDS FROM THE VAS SPLIT-WINDOW CHANNELS AT 11 AND 12 MICRONS**

Dennis Chesters, Louis W. Uccellini, and Wayne Robinson *In its* VISSR Atmospheric Sounder (VAS) Res. Rev. Mar. 1983 p 5-6 Prepared in cooperation with Computer Sciences Corp., Silver Spring, Md. (For primary document see N83-24028 13-47)

Avail: NTIS HC A04/MF A01 CSCL 04B

Originally, the VAS split window channels were designed to use the differential water vapor absorption between 11 and 12 microns to estimate sea surface temperature by correcting for the radiometric losses caused by atmospheric moisture. It is shown that it is possible to reverse the procedure in order to estimate the vertically integrated low level moisture content with the background surface (skin) temperature removed, even over the bright, complex background of the land. Because the lower troposphere's water vapor content is an important factor in convective instability, the derived fields are of considerable value to mesoscale meteorology. Moisture patterns are available as quantitative fields (centimeters of precipitable water) at full VAS resolution (as fine as 7 kilometers horizontal resolution every 15 minutes), and are readily converted to image format for false color movies. The technique, demonstrated with GOES-5, uses a sequence of split window radiances taken once every 3 hours from dawn to dusk over the Eastern and Central United States. The algorithm is calibrated with the morning radiosonde sites embedded within the first VAS radiance field; then, entire moisture fields are calculated at all five observation times. Cloud contamination is removed by rejecting any pixel having a radiance less than the atmospheric brightness determined at the radiosonde sites. S.L.

**N83-24031*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

**DIAGNOSING CONVECTIVE INSTABILITY USING VAS DATA**

Ralph A. Petersen, Louis W. Uccellini, Dennis Chesters, Anthony Mostek (Computer Sciences Corp., Silver Spring, Md.), and Dennis Keyser (GE, Beltsville, Md.) *In its* VISSR Atmospheric Sounder (VAS) Res. Rev. Mar. 1983 p 7 (For primary document see N83-24028 13-47)

Avail: NTIS HC A04/MF A01 CSCL 04B

The utility of combining visible and various infrared images from the VAS to produce a forecasting tool, that can be available on a near real time basis, to predict severe weather development is shown. Areas where dry air in the midtroposphere overlays substantial moisture at low levels are used to diagnose mesoscale regions that have the potential for being convectively unstable before the onset of severe convection. Specifically, 6.7 micron water vapor imagery, used for isolating regions of substantial midlevel dryness, are combined with images of low level clouds or with split-window low level moisture images to delineate regions that have the potential for convective instability. In areas where scattered low level clouds are present, computer generated, color image combinations are used to isolate those warm, low level clouds that are in potential convectively unstable environments from clouds that exist under a deeply moist atmosphere. In clear regions, the split window technique is used for delineating areas of substantial boundary layer moisture. These images are again computer overlayed by the midlevel dryness to produce a color coded image of potential convective instability. S.L.

**N83-24032*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

**USE OF THE VAS FOR ANALYSIS OF A PRETHUNDERSTORM ENVIRONMENT**

Louis W. Uccellini, Ralph A. Petersen, Dennis Chesters, Anthony Mostek (Computer Sciences Corp., Silver Spring, Md.), and T. H. Lee (Computer Sciences Corp., Silver Spring, Md.) *In its* VISSR Atmospheric Sounder (VAS) Res. Rev. Mar. 1983 p 9 ref (For primary document see N83-24028 13-47)

Avail: NTIS HC A04/MF A01 CSCL 04B

The information content of the VAS radiances can be converted to meteorological parameters useful for analyzing a severe weather environment. The method by which the VAS variances are converted to vertical profiles of temperature, dewpoints, and equivalent potential temperature involves a basic regression technique using the most local radiosonde data available for establishing a correlation matrix. The results indicate that mesoscale features apparent within images of the radiances can be converted to usable temperature and moisture fields using regression when surface temperature and dewpoint observations are included within the total data base. In addition, results indicate that surface data are very important for better defining lower tropospheric structure that the VAS radiances alone cannot properly resolve. Analyses of these retrievals distinctly show mesoscale structure in the temperature and moisture fields derived with VAS radiances collected every 3 hours, and 0000 GMT. The retrievals capture the moisture structure. More important, convective instability is clearly detected immediately before the onset of convection. The results indicate that the VAS is capable of providing valuable mesoscale information suitable for analyzing a preconvective environment that is generally clear. S.L.

**N83-24033*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

**ANALYSIS OF MULTISPECTRAL DATA USING AN UNSUPER-**

**VISED CLASSIFICATION TECHNIQUE: APPLICATION TO VAS**
Gerard Szejwach *In its* VISSR Atmospheric Sounder (VAS) Res. Rev. Mar. 1983 p 11-12 ref (For primary document see N83-24028 13-47)
Avail: NTIS HC A04/MF A01 CSCL 04B

A statistical classification method based on clustering of multidimensional histograms was applied to several channels of the VAS multispectral imagery. The method automatically discriminates and classifies atmospheric ground features such as cloud types, atmospheric moisture patterns, ocean, or ground. Such a clustering method has the advantage of forming natural data groupings, without a priori classification. Clusters are not limited by straight lines or plane surfaces as is the case in threshold methods. The method was applied to simultaneous full resolution images from channels 8 (11.2 micron), 10 (6.7 micron), and 12 (3.9 micron). Twenty image segments of 64 by 64, 12 image segments of 128 by 128, and 4 image segments of 254 by 254 picture elements were analyzed. In addition, normal VISSR mode images at 1800, 1830, and 2000 GMT were used to identify the classes. The gray levels measured along a scan line and the result of the classification scheme (dashed curves) for the three channels investigated are shown. Each point of the image is affected to a class. Each class is identified by a center of gravity that is represented by a vector in the three dimensional space of gray levels. S.L.

**N83-24034*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
**THE INFERENCE OF TROPICAL CYCLONE DYNAMICS USING GOES VISSR/VAS DATA**
Edward B. Rodgers and J. Stout (Computer Sciences Corp., Silver Spring, Md.) *In its* VISSR Atmospheric Sounder (VAS) Res. Rev. Mar. 1983 p 13-16 refs Original contains color illustrations (For primary document see N83-24028 13-47)
Avail: NTIS HC A04/MF A01 CSCL 04B

The sequence of events observed during tropical cyclone Emily, was suggested as a possible mechanism for cyclogenesis. Geostationary Operational Environmental Satellite (GOES) East VISSR/VAS sensors were used. The VISSR visible imagery obtained every 15 minutes was used to define the low tropospheric cyclonic vortex and upper tropospheric horizontal convergence. The VAS water vapor (channels 9 and 10) and carbon dioxide (channels 3 and 4) channels were used to infer upper and middle tropospheric subsidence by monitoring the Adiabatic compressional drying and warming, respectively, occurring within this layer. Evidence of an existing lower tropospheric cyclonic vortex was seen. The satellite derived wind vectors (length of vector is proportional to wind velocity, where the strongest winds were approximately 35 knots) are superimposed on the GOES visible image of tropical storm Emily. Vectors and low level clouds depict the center of the cyclonic vortex immediately south of the large convective cell in the center of the image. Upper tropospheric cloud tracers and rawinsonde reports along the Eastern United States suggest that the southwesterly environmental upper atmospheric flow is converging with the outflow from the convective cell north of the vortex. S.L.

**N83-24035*#** National Oceanic and Atmospheric Administration, Madison, Wis. National Environmental Satellite Service.
**VAS ASSESSMENT STATUS AND PRELIMINARY RESULTS**
William L. Smith *In* NASA. Goddard Space Flight Center VISSR Atmospheric Sounder (VAS) Res. Rev. Mar. 1983 p 17-19 (For primary document see N83-24028 13-47)
Avail: NTIS HC A04/MF A01 CSCL 04B

The VAS soundings, produced in real time on an hourly basis, consistently delineate the areas of the country where intense convective weather will occur several hours in advance of the severe weather developments. This conclusion is based on the daily experience gained. An objective method of forecasting the probability of severe weather for 100 kilometer square areas of the United States from the VAS soundings was presented. An example sequence of these probability forecasts and the subsequent observed severe weather is included. S.L.

**N83-24036*#** National Oceanic and Atmospheric Administration, Kansas City, Mo. Satellite Field Services Station.
**VAS OPERATIONAL PROCEDURES AND RESULTS AT THE KANSAS CITY SATELLITE FIELD SERVICES STATION**
Brian Heckman, William Carle, and Richard Anthony *In* NASA. Goddard Space Flight Center VISSR Atmospheric Sounder (VAS) Res. Rev. Mar. 1983 p 21-24 (For primary document see N83-24028 13-47)
Avail: NTIS HC A04/MF A01 CSCL 04B

An operational assessment of VAS data by using a Man-computer Interactive Data Access System (McIDAS) terminal linked by a 9600 band telephone line is discussed. Seven hours of VAS data were processed and edited daily. Data was scheduled 16 hours a day, 7 days a week; however, during this time period there were very few days with 16 hours of data to evalute. The McIDAS terminal, which has 10 display frames and 5 graphics, provide access to the sounding data processed. These data are processed using two procedures. The dwell sounding data are generated by using all 12 spectral channels with a spin budget of 39. To provide coverage for most of the United States, soundings are made starting at 18 minutes after the hour from approximately 49 deg N to 36 deg N and at 48 minutes after the hour from 36 deg N to 26 deg N. The dwell imaging mode uses 11 channels but the spin budge is 17. With the reduced spin budget, retrievals can be made at 18 or 48 minutes after the hour for approximately 44 deg N to 27 deg N. With these constraints a schedule, of data sets was proposed to use the schedule and how the data set could be used are shown. S.L.

**N83-24037*#** Wisconsin Univ., Madison.
**SPECIFYING HEIGHTS AND VELOCITIES OF CLOUD MOTION FROM GEOSTATIONARY SOUNDING DATA**
Paul Menzel, Tod R. Stewart, and William L. Smith (NOAA, Madison, Wis.) *In* NASA. Goddard Space Flight Center VISSR Atmospheric Sounder (VAS) Res. Rev. Mar. 1983 p 25-26 (For primary document see N83-24028 13-47)
Avail: NTIS HC A04/MF A01 CSCL 04B

Data from the geostationary Visible Infrared Spin-Scan Radiometer (VISSR) Atmospheric Sounder (VAS) for assigning simultaneous heights and velocities of cloud motion winds were processed. The following two techniques are discussed: The technique which delivers qualitative height assignments from imagery; and which uses the radiometric information contained in the VAS data to calculate quantitative heights. E.A.K.

**N83-24038*#** National Meteorological Center, Washington, D.C.
**EVALUATION OF THE EFFECT OF VAS DATA ON SOME NMC ANALYSES AND FORECASTS**
Edward A. OLenic and Norman A. Phillips *In* NASA. Goddard Space Flight Center VISSR Atmospheric Sounder (VAS) Res. Rev. Mar. 1983 p 27-28 refs (For primary document see N83-24028 13-47)
Avail: NTIS HC A04/MF A01 CSCL 04B

The effect of visible/infrared atmospheric sounder (VAS) data on the limited area fine mesh model (LFM) analysis forecast system were examined. The VAS data obtained from the Pacific geostationary satellite are valuable for LFM analysis because temperatures from the polar orbiting satellite over the east Pacific are received too late for 1200 GMT LFM analysis. Because the VISSR has only infrared channels, retrievals are possible only in regions with little or no cloudiness. E.A.K.

**N83-24039*#** National Oceanic and Atmospheric Administration, Washington, D. C. National Environmental Satellite Service.
**USE OF THE VAS WATER VAPOR IMAGERY TO ANALYZE UPPER-LEVEL FLOW PATTERNS**
Ralph K. Anderson *In* NASA. Goddard Space Flight Center VISSR Atmospheric Sounder (VAS) Res. Rev. Mar. 1983 p 29-30 (For primary document see N83-24028 13-47)
Avail: NTIS HC A04/MF A01 CSCL 04B

Infrared (IR) channels which are available and are developed for operational use were examined. The Visible Infrared Spin-Scan Radiometer (VISSR) Atmospheric Sounder (VAS) was launched.

This instrument has a radiometer consisting of the standard visible channel detectors and six thermal detectors that detect IR radiation in 12 spectral bands. Any one of the 11 new IR channels can be substituted for the standard 11.5 micro m window channel when the satellite is operating in the standard VISSP mode and provides data in image form through the GOES distribution system. E.A.K.

**N83-24040*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
**CORRELATION OF 3 HOUR RADIOSONDE DATA WITH COINCIDENT NIMBUS-7 TOTAL OZONE MEASUREMENTS**
James A. Gatlin *In its* VISSR Atmospheric Sounder (VAS) Res. Rev. Mar. 1983 p 31 (For primary document see N83-24028 13-47)
Avail: NTIS HC A04/MF A01 CSCL 04B

A special network exercise supporting the VAS demonstration is reported. The second near-real time total ozone mapping spectrometer (TOMS) activity involving out of sequence processing of Nimbus-7 data over the United States and Europe is presented. The ozone data maps were used by airlines to search for regions of clear air turbulence and by an aircraft data gathering program, for synoptic upper air and tropopause height analyses. The TOMS total ozone levels are correlated with radiosonde tropopause height for testing the ability of TOMS data to give independent satellite measurements of tropopause height. E.A.K.

**N83-24041*#** National Oceanic and Atmospheric Administration, Madison, Wis. National Environmental Satellite Service.
**VAS TEMPERATURE RETRIEVALS FOR NASA SPECIAL NETWORK OBSERVATIONS OF 6 MARCH 1982**
Christopher M. Hayden *In* NASA. Goddard Space Flight Center VISSR Atmospheric Sounder (VAS) Res. Rev. Mar. 1983 p 33-36 (For primary document see N83-24028 13-47)
Avail: NTIS HC A04/MF A01 CSCL 04B

VAS retrieval capability was studied. A mesoscale event consisting of a rapidly moving temperature perturbation with strong horizontal wind shear but shallow vertical extent occurred over Texas. The mesoscale event passed through the special radiosonde network and was documented with three hourly measurements. The event occurred behind a cold frontal cloud band during clear conditions. The event was accompanied by large skin temperature changes as the day progressed. This combination allows the testing of two important aspects of the retrieval algorithms with minimal cloud contamination and good ground truth. The first aspect concerns the horizontal and vertical resolving power of the retrievals and the second aspect concerns sensitivity to the boundary term. The NASA special network radiosonde is proven to be useful. It is demonstrated that: the VAS is capable, of delineating a mesoscale, normal retrieval procedure has the deficiency of oversmoothing, but this can be corrected, to document first quess dependence, and a superior data set to evolve better techniques for treating the surface boundary problem. E.A.K.

**N83-24042*#** Texas A&M Univ., College Station. Dept. of Meteorology.
**AVE/VAS EXPERIMENT: GROUND TRUTH NETWORK**
James R. Scoggins *In* NASA. Goddard Space Flight Center VISSR Atmospheric Sounder (VAS) Res. Rev. Mar. 1983 p 37-38 (For primary document see N83-24028 13-47)
Avail: NTIS HC A04/MF A01 CSCL 04B

The visible/infrared spin scan radiometer (VISSR) atmospheric sounder (VAS) rawinsonde field program is discussed. Specific items covered include: planning, personnel requirements and training, operational requirement and procedures, sounding times and dates, methods of data processing, data inventory, and status of data processing. E.A.K.

**N83-24043*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
**AVE/VAS EXPERIMENT: SYNOPTIC SUMMARY AND PRELIMINARY RESULTS**
Gary J. Jedlovec *In* NASA. Goddard Space Flight Center VISSR Atmospheric Sounder (VAS) Res. Rev. Mar. 1983 p 39-43 (For primary document see N83-24028 13-47)
Avail: NTIS HC A04/MF A01 CSCL 04B

The AVE/VAS ground truth field experiment was conducted during the Spring of 1982 severe storms and weather research program. The experiment consisted of acquiring correlative ground truth measurements of rawinsonde data, corresponding to the time and space resolutions of VAS sounding data. The objectives of the AVE/VAS experiment are: (1) to acquire four dimensional data sets of the actual atmospheric structure down to the mesoscale; (2) to provide measurements for quantitative comparisons between ground based and VAS-derived atmospheric parameters; (3) to evaluate the impact of VAS data on diagnostic analysis of structural features and dynamical processes important to the development of mesoscale phenomena; (4) to evaluate the impact of VAS data on numerical model simulations, nowcasting, and other mesoscale forecasting systems. E.A.K.

**N83-24044*#** Cooperative Inst. for Research in the Atmosphere, Fort Collins, Colo.
**VAS APPLICATIONS AT COLORADO STATE UNIVERSITY**
Melanie Kruidenier *In* NASA. Goddard Space Flight Center VISSR Atmospheric Sounder (VAS) Res. Rev. Mar. 1983 p 45-47 refs (For primary document see N83-24028 13-47)
Avail: NTIS HC A04/MF A01 CSCL 04B

The application of the VAS program is outlined. The initial assessments of VAS radiometer and satellite performance were satisfactory; and VAS operations were smoothly carried out by the NESS SOCC and associated processing and retransmission facilities. The availability of advanced image processing systems, previous studies with the geosynchronous European Space Agency Meteorological Satellite (Meteosat), and the polar orbiter multichannel radiance data enabled the progress of the application. The VAS data are implemented as these data are received in the real time VISSR mode, and as dwell sounding (DS) and multispectral imaging (MSI) radiances on magnetic tapes. E.A.K.

**N83-24045*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
**FUTURE RESEARCH CONTRIBUTIONS OF THE VAS**
William E. Shenk *In its* VISSR Atmospheric Sounder (VAS) Res. Rev. Mar. 1983 p 49-50 (For primary document see N83-24028 13-47)
Avail: NTIS HC A04/MF A01 CSCL 04B

The VAS data which are used for studying and predicting numerous meteorological phenomena are discussed. These phenomena include severe local storm antecedent conditions, the formative stages of tropical cyclones, the definition of upper tropospheric circulation features, and as input to synoptic scale prediction models. E.A.K.

**N83-24046*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
**SOME POTENTIAL RESEARCH APPLICATIONS OF GOES/VAS DATA IN METEOROLOGY**
Gregory S. Wilson *In* NASA. Goddard Space Flight Center VISSR Atmospheric Sounder (VAS) Res. Rev. Mar. 1983 p 51-52 (For primary document see N83-24028 13-47)
Avail: NTIS HC A04/MF A01 CSCL 04B

The understanding and utilization of radiance data from the VAS instrument for meteorological purposes which requires an extensive and organized research plan whose ultimate goal is to provide quantitative measurements of the structure/dynamics of the atmosphere is outlined. The unique multispectral VAS data are potentially useful in almost all aspects of meteorology but have immediate applications in the mesoscale and severe storm research area since measurements are available over regional areas at time intervals of less than 1 hour. The higher priority research applications of VAS data pertaining to the interpretation and utilization of the passive VAS radiance measurements for mesoscale and severe-storm research are reviewed. E.A.K.

**N83-24047*#** Texas A&M Univ., College Station.
**AVE/VAS 1: 25 MB SOUNDING DATA Interim Report**
Meta E. Sienkiewicz Mar. 1983 53 p ref
(Contract NAS8-34133)
(NASA-CR-170735; NAS 1.26:170735) Avail: NTIS HC A04/MF A01 CSCL 04B

The rawinsonde sounding program for the AVE/VAS I (shakedown) experiment is described. Tabulated data at 25-mb intervals for the 13 special rawinsonde stations and 1 National Weather Service station participating in the experiment are presented. Soundings were taken at 1200 and 1800 GMT on February 6, 1982, and at 0000 GMT on February 7, 1982. The method of processing soundings is discussed briefly, estimates of the RMS errors in the data are presented, and an example of contact data is given. Termination pressures of soundings are tabulated, as are observations of ground temperature at a depth of 2 cm.
Author

**N83-24048*#** Control Data Corp., Minneapolis, Minn.
**FLIGHT SUMMARIES AND TEMPERATURE CLIMATOLOGY AT AIRLINER CRUISE ALTITUDES FROM GASP (GLOBAL ATMOSPHERIC SAMPLING PROGRAM) DATA Final Report**
G. D. Nastrom and W. H. Jasperson Mar. 1983 369 p refs
(Contract NAS3-21249)
(NASA-CR-168106; NAS 1.26:168106) Avail: NTIS HC A16/MF A01 CSCL 04B

Temperature data obtained by the Global Atmospheric Sampling Program (GASP) during the period March 1975 to July 1979 are compiled to form flight summaries of static air temperature and a geographic temperature climatology. The flight summaries include the height and location of the coldest observed temperature and the mean flight level, temperature and the standard deviation of temperature for each flight as well as for flight segments. These summaries are ordered by route and month. The temperature climatology was computed for all statistically independent temperture data for each flight. The grid used consists of 5 deg latitude, 30 deg longitude and 2000 feet vertical resolution from FL270 to FL430 for each month of the year. The number of statistically independent observations, their mean, standard deviation and the empirical 98, 50, 16, 2 and .3 probability percentiles are presented.
Author

**N83-24049#** Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
**A LOW LATITUDE FRONTAL PENETRATION AND ITS EFFECTS ON TROPICAL CONVECTIVE ACTIVITY**
Vernon E. Kousky and Hassan Virji Nov. 1982 19 p refs
Presented at the 2nd Brazil. Meteorol. Congr., Pelotas, 1982
(INPE-2582-PRE/230) Avail: NTIS HC A02/MF A01

The strong interaction between a frontal system originating in mid latitudes and tropical convection was studied. During the passage of a cold front in eastern Brazil, tropical convection increased, first in western Amazonas and subsequently in the central and eastern portions of the Amazon basin. The tropical convective activity propagation to the east is linked to the frontal passage farther south. There were significant accelerations in the jet streams of both hemispheres during this period. It is suggested that frontal penetrations are important in organizing tropical convection over South America.
E.A.K.

**N83-24050*#** Pennsylvania State Univ., University Park. Dept. of Meteorology.
**A METHOD FOR DIAGNOSING SURFACE PARAMETERS USING GEOSTATIONARY SATELLITE IMAGERY AND A BOUNDARY-LAYER MODEL M.S. Thesis**
Arthur C. Polansky Nov. 1982 130 p refs
(Contract NAS5-26456; Grant NAG5-184)
(NASA-CR-170265; NAS 1.26:170265) Avail: NTIS HC A07/MF A01 CSCL 04B

A method for diagnosing surface parameters on a regional scale via geosynchronous satellite imagery is presented. Moisture availability, thermal inertia, atmospheric heat flux, and total evaporation are determined from three infrared images obtained from the Geostationary Operational Environmental Satellite (GOES). Three GOES images (early morning, midafternoon, and night) are obtained from computer tape. Two temperature-difference images are then created. The boundary-layer model is run, and its output is inverted via cubic regression equations. The satellite imagery is efficiently converted into output-variable fields. All computations are executed on a PDP 11/34 minicomputer. Output fields can be produced within one hour of the availability of aligned satellite subimages of a target area.
Author

**N83-24051#** Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
**SONDAC: TEST, CALIBRATION AND USE OF AN ACOUSTIC SOUNDER FOR METEOROLOGICAL PURPOSES**
Fausto Carlos deAlmeida (IAG-USP/FAPESP) and Jorge Artur Ramos Nov. 1982 14 p refs In PORTUGUESE; ENGLISH summary Presented at the 2nd Brazil. Meteorol. Congr., Pelotas, 1982
(INPE-2571-PRE/219) Avail: NTIS HC A02/MF A01

The first results of a field test of an acoustic sounder are presented. The SONDAC, as it is called, has 130 W of pulsating electric power, variable frequency of 1500, 2500 and 3500 HZ, complete transmission reception cycles from 1 to 10 sec and pulses of 10, 100 and 200 m sec, duration. A brief historic and theoretical review about acoustic sounders and its utilization is also presented.
Author

**N83-24052#** Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
**INFLUENCES OF THE SYNOPTIC SCALE CIRCULATION ON THE SEA BREEZE CIRCULATION ALONG THE NORTHERN AND NORTH EASTERN COAST OF SOUTH AMERICA**
Iracema F. A. Cavalcanti and Vernon E. Kousky Nov. 1982 15 p refs In PORTUGUESE; ENGLISH summary Presented at the 2nd Brazil. Meteorol. Conf., Pelotas, 1982
(INPE-2573-PRE/221) Avail: NTIS HC A02/MF A01

Influences of large scale systems on sea breeze are investigated. Convection associated with the sea breeze is verified by observing the formation of a line of cumulonimbi along the north-northeast coast of South America after 1800 GMT in satellite imagery. Climatological analysis of the occurrence of the convective line associated with the sea breeze shows a variation in its location along the coast in the same direction as the seasonal variation of the ITCC. The mean monthly analysis of divergence shows that the ITCZ is better organized and more intense in winter (Southern Hemisphere), when the frequency of cumulonimbus development along the coast is high. At times, the convective activity associated with the sea breeze appears to be enhanced by the presence of low level convergence associated with the surges in trades and with the low altitude penetration of cold fronts. The presence of synoptic system, favoring rising air motion, generally enhances the convective activity due to local wind system.
Author

**N83-24053#** Instituto de Pesquisas Espaciais, Sao Paulo (Brazil).
**A METHOD TO ESTIMATE AGRICULTURAL PRODUCTIVITY [UM METODO DE ESTIMATIVA DE PRODUTIVIDADE AGRICOLA]**
Orion de Oliveira Silva Nov. 1982 9 p refs In PORTUGUESE; ENGLISH summary Presented at the 2nd Brazil. Meteorol. Conf., Pelotas, 18-22 Oct. 1982
(INPE-2566-PRE/214) Avail: NTIS HC A02/MF A01

A method to estimate agricultural productivity was suggested. A comparison between the real productivity and the productivity estimated by this method showed a low percentual error for some base-years. The problem of identifying a priori which year should be taken as the basis for a better estimation was left open. This problem is solved and a new method to estimate agricultural productivity using fuzzy inference and linear regression is proposed. A way to utilize the new method using a bank of rules obtained from historical productivity series (corn culture) and climatological variables is presented. Criteria and algorithms are proposed given a set of annual historical rules.
Author

**N83-24054#** Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

**TWO SEVERE FREEZES IN BRAZIL: PRECURSORS IN THE PACIFIC OCEAN AND SYNOPTIC EVOLUTION IN SOUTH AMERICA**

Michael A. Fortune, Vernon E. Kousky, and Nelson J. Ferreira Nov. 1982 31 p refs In PORTUGUESE; ENGLISH summary Presented at the 2nd Brazilian Meteorol. Congr., Pelotas, 1982
(INPE-2587-PRE/235) Avail: NTIS HC A03/MF A01

Two freezes with repercussions on world coffee markets struck Brazil in recent years. Data from multiple sources including satellites and drifting buoys were analyzed for early warning signs and synoptic evolution of the freeze events. Two important precursors were found: (1) a slowly moving long wave pattern in the Central South Pacific Ocean amplified greatly one to two days before frontogenesis in South America and four to five days before the freezes in Brazil; and (2) the long wave ridge, when at maximum amplitude, was located near the southern Andes, and the next long wave trough downstream was located in the South Atlantic at the longitude of Brazil. This configuration channelled subantarctic air northward entirely over land into subtropical latitudes. Frontogenesis in low latitudes in the mid-Pacific was the first sign of wave amplification in the 1979 case. Subsequent frontogenesis in northern Argentina was accelerated by the opportune approach of a short wave trough one day before the downstream long wave trough reached greatest amplitude in southern Brazil. Author

**N83-24055#** Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

**A REPORT ON THE PRECIPITATION REGIME OF 1981 - 1982 IN NORTHEAST BRAZIL IN RELATION TO DROUGHT FORECASTING METHODS**

Antonio Divino Moura and Vernon Edgar Kousky Nov. 1982 22 p refs In PORTUGUESE; ENGLISH summary Presented at the 2nd Congr. Brasil. de Meteorol., Pelotas, Brazil, 1982
(INPE-2569-PRE/217) Avail: NTIS HC A02/MF A01

Spatial distributions of percent of normal monthly precipitation are presented for the months immediately prior to and during the 1982 rainy season in Northeast Brazil. The results show that the state of Ceara recieved near or below normal rainfall in most areas, and the temporal distribution was quite good. A qualitative evaluation of several methods proposed for precipitation forecasting for the Northeast has been made. The methods considered are: (1) teleconnections with cyclonic activity in the region of Newfoundland/Greenland; (2) relationship to Atlantic ocean surface temperature anomalies; (3) preseason rainfall; and (4) time series extrapolation by harmonic analysis. Author

**N83-24056#** Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

**GENERAL CIRCULATION MODELS: POSSIBLE APPLICATION FOR BRAZIL**

Yoshihiro Yamazaki, Marco Antonio Maringolo Lemes, and Sergio Henrique Franchito Nov. 1982 12 p refs In PORTUGUESE; ENGLISH summary Presented at the 2nd Congr. Brasil. de Meteorol., Pelotas, Brazil, 1982
(INPE-2568-PRE/216) Avail: NTIS HC A02/MF A01

The importance of the research on climate and its variability stems from their impact on human activities. General circulation models are scientifically discussed, with emphasis on the need of such models as indispensable tools for tackling climate-related problems in Brazil. With the installation of the Atmospheric Modelling Center (CEMA) in the Department of Meteorology INPE/CNPq, numerical experiments of climatic simulation with simple GCM's have become a reality. One of these models is described and some future studies are suggested. Author

**N83-24057#** Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

**AN OBSERVATIONAL STUDY ON UPPER TROPOSPHERIC COLD LOWS OVER THE SUBTROPICAL SOUTH ATLANTIC AND EASTERN BRAZIL**

Manoel Alonso Gan and Vernon E. Kousky Nov. 1982 27 p refs In PORTUGUESE; ENGLISH summary Presented at the 2nd Brazil. Meteorol. Congr., Pelotas, 1982
(INPE-2577-PRE/227) Avail: NTIS HC A03/MF A01

Upper tropospheric cold lows in the subtropics are studied using satellite imagery. It is observed that the moist cold lows (those having significant cloudiness) form from September to May. The formation of these cyclones is preceded by an intensification of a ridge in the southwest of the cold low. Author

**N83-24058#** Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

**SPATIAL SCALE OF PRECIPITATION ANOMALIES FOR YEARS OF SEVERE DROUGHT IN NORTHEAST BRAZIL**

Antonio Divino Moura and Mary Toshie Kagano Nov. 1982 18 p refs In PORTUGUESE; ENGLISH summary Presented at the 2nd Brazilian Meteorol. Congr., Pelotas, 1982
(INPE-2585-PRE/233) Avail: NTIS HC A02/MF A01

The spatial distribution of the deviation of precipitation from the normal over tropical South America and western Africa was investigated using the available data since the beginning of the century up to the seventies. The spatial scales associated with these deviations were determined based on precipitation deviation for dry and wet years for Northeast Brazil. It was found that, on the average, the NE drought spatial scale is not confined to that region but extends from South America to Africa, and perhaps more to the East. The results show that there is an inverse relationship between the Northeast Brazil and Guyanas rainfall, in accordance with the previous results. It was found that years of drought in the Northeast Brazil are also extremely dry over the south equatorial region of Africa, west of 20 deg E. The conclusion is that the spatial scale of the atmospheric and oceanic phenomena associated with drought of Northeast Brazil is not regional, but seems to extend from South America to Africa. Author

**N83-24059#** Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

**DISTRIBUTION OF TOTAL CLOUD AMOUNT IN BRAZIL**

J. A. Torsani and Y. Vixwanadham Nov. 1982 16 p refs In PORTUGUESE; ENGLISH summary Presented at the 2nd Brazil. Meteorol. Conf., Pelutas, 1982
(INPE-2575-PRE/223) Avail: NTIS HC A02/MF A01

The surface climatological data for approximately 300 Brazilian stations are available for a period of 10 years (1961 to 1970). From these data a study of the seasonal distribution of 1200 GMT total cloud amount over Brazil is made. The analysis for coastal regions is considered better due to the more number of surface stations network. Total cloud amount variability is related with such factors like the topography, season, coast line formation and the local wind systems. Further attempts were made to compare these results with digitally processed cloud amount from the satellite images. Correlations will be employed to evaluate the relationships between the total cloud amount and the others meteorological parameters like temperature, humidity and precipitation. Author

**N83-24060#** Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

**A SPECTRAL GLOBAL BAROTROPIC MODEL WITH NORMAL MODE INITIALIZATION**

Jose Paulo Bonatti and Pedro Leite da S. Dias (Sao Paulo Univ.) Nov. 1982 18 p refs In PORTUGUESE; ENGLISH summary Presented at the 2nd Brazil. Meteorol. Congr., Pelotas, 1982
(INPE-2584-PRE/232) Avail: NTIS HC A02/MF A01

Primitive equations barotropic spectral model is developed using the Hough functions as the basis. The original system of partial differential equations is reduced to a coupled system of ordinary differential equations for the coefficients of expansion. Four methods of resolution for the coupled system are discussed and a semianalytic scheme is chosen. This scheme preserves the solution of the linear part of the system. The model is applied to the problem of linear and nonlinear normal mode initialization. Two examples are studied: (1) nonzero initial wind field and a consistent mass field without external forcing (nonlinear model)

and (2) zero initial wind field and with a forcing in mass field (linear model). The experiments presented contain two geostrophic vortices placed symmetrically with respect to the equator. The forced case emphasizes the importance of knowing the diabatic heat sources for initialization in prediction models. The linear and nonlinear initializations improve the results in terms of the attenuation effect to the gravity waves created by the nonlinear and forcing terms. B.W.

**N83-24061#** Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
**IMPLANTATION OF A LIMITED AREA FINE MESH MODEL FOR NUMERICAL WEATHER PREDICTION. PART 1: DESCRIPTION**
Prakki Satyamurty and Yoshihiro Yamazaki Nov. 1982 14 p refs In PORTUGUESE; ENGLISH summary Presented at the 2nd Congr. Brasil. de Meteorol., Pelotas, 1982
(INPE-2581-PRE/229-Pt-1) Avail: NTIS HC A02/MF A01

A simplified version of the Limited area Fine Mesh (LFM) model for the numerical weather prediction is being adapted in the Centro de Modelagem Atmosferica (CEMA) of the Instituto de Pesquisas Espaciais (INPE). The equations, the discretization, and the numerical integration procedure, as well as an estimate of the data processing and the computational facilities needed, are presented. Author

**N83-24062#** National Oceanic and Atmospheric Administration, Washington, D. C. Land Sciences Branch.
**ARE MONTHLY AND SEASONAL SNOW COVER FORECASTS POSSIBLE**
Donald R. Wiesnet and Michael Matson [1982] 9 p refs Presented at the 38th Ann. Meeting of the Eastern Snow Conf., Syracuse, N.Y., 4-5 Jun. 1981
Avail: NTIS HC A02/MF A01

Continental snow cover, because of its slowly varying nature, is one feature of the climate system that may favor seasonal or monthly advance estimates. The NOAA/NESS satellites have recorded continental snow cover since 1966, thus providing some of the necessary observational data input for testing such advance estimates. Satellite based regression algorithms for continental snow cover estimates and the usefulness of the algorithms over a year period, 1976-81, are examined. E.A.K.

**N83-24063#** Cologne Univ. (West Germany). Inst. fuer Geophysik und Meteorologie.
**CLOUD PARAMETERIZATION IN CIRCULATION MODELS [WOLKENPARAMETRISIERUNGEN IN ZIRKULATIONSMODELLEN]**
A. Hense 1982 99 p refs In GERMAN; ENGLISH summary
(Mitt-35; ISSN-0069-5882) Avail: NTIS HC A05/MF A01

From the variety of parametrizations, which estimate the cloud cover from relative humidity, two are compared with a newly developed one. This new parametrization offers the possibility to calculate the cloudcover and cloud liquid water content within a grid volume of the circulation model. Author

**N83-24064#** World Meteorological Organization, Geneva (Switzerland).
**REPORT OF THE THIRD SESSION OF THE INTERGOVERNMENTAL PANEL MEETING ON ALPEX Global Atmospheric Research Programme**
1982 122 p refs Conf. held at Geneva, Oct. 1982 Prepared in cooperation with ICSU, Rome
(GARP-Spec-Rept-40) Avail: NTIS HC A01; print copy available at WMO, Geneva, SWFR 15

The main aspects of the International Alpex Data Center (IADC) Management plan are described. The role of IADC was to create two data sets. The IADC had to build up the computer compatible quick look data set and the alpex level li-b data set. Author

**N83-24065#** World Meteorological Organization, Geneva (Switzerland). Commission for Marine Meteorology Working Group on Marine Meteorological Services.
**GUIDE TO MARINE METEOROLOGICAL SERVICES**
1982 222 p refs
(WMO-471; ISBN-92-63-12471-X) Avail: NTIS MF A01; print copy available at WMO, Geneva

The two functions of marine meteorological services which are: (1) to serve international shipping, fishing and other marine activities on the high seas; (2) to serve the various activities which take place in coastal and off shore areas and on the coast itself are discussed. The recruitment of voluntary observing ships, the training of shipboard and shore personnel, the development of marine communication systems, the reception, distribution and archiving of observations are considered. A major part of a marine meteorological program permits the two functions to be fully supported and implemented. It is recommended that each part of a marine meteorological program has a monitoring system to evaluate the program at regular intervals. E.A.K.

**N83-24066#** World Meteorological Organization, Geneva (Switzerland).
**A STUDY OF THE AGROCLIMATOLOGY OF THE HUMID TROPICS OF SOUTH-EAST ASIA**
L. R. Oldeman and M. Frere 1982 261 p refs Prepared in cooperation with Food and Agriculture Organization of the United Nations and UNESCO
(WMO-597; WMO-TN-179; ISBN-92-63-10597-9) Avail: NTIS MF A01; print copy available at WMO, Geneva. SWFR 45

The agroclimatic environment of the humid tropics is described in relation to climate and soils, and agricultural activities in the regions are discussed. Methods to interpret the agroclimatic variables in relation to crop production and cropping strategies are discussed, and possible ways to classify and delineate the agroclimatic environment are indicated. S.L.

**N83-24067#** World Meteorological Organization, Geneva (Switzerland).
**WORLD WEATHER WARN. REPORT Status Report**
1982 126 p refs
(WMO-601; ISBN-92-63-10601-0; SR-11) Avail: NTIS HC A01; print copy available at WMO, Geneva

The Global Observing System (GOS) is concerned with taking measurements and making other observations required to describe the state of the atmosphere and the related environment. The purpose of the GOS is to provide WMO members with observational data from all parts of the world for use both in operational and research work. The GOS consists of two major sub-systems: the surface based subsystem and the space based subsystem. The former comprises stations of various kinds making observations at or from the surface of the Earth and oceans, including observations made aboard aircraft and by instruments carried aloft by balloons or rockets. The main components of this subsystem are the networks of surface and upper air meteorological observing stations maintained by members for their own use and as a contribution to international meteorology. The surface based subsystem also includes stations in mobile networks such as ships at sea and aircraft in flight; and a wide range of spacial stations used to measure or record elements of special interest. Author

**N83-24068#** World Meteorological Organization, Geneva (Switzerland).
**ABRIDGED REPORT OF THE 7TH COMMISSION FOR AERONAUTICAL METEOROLOGY Final Report**
1982 179 p Conf. held at Montreal, 14 Apr. - 7 May 1982 Conf. held in conjointly with ICAO Commun./Meteorol. (COM/MET) Div Meeting, Montreal, 20-30 Apr. 1982 and 3-6 May 1982
(WMO-602; ISBN-92-63-10602-9) Avail: NTIS HC A01; print copy available at WMO, Geneva, SWFR 25

The world meteorological organization (WMO) World Weather Watch which comprised the Global Observing System, the Global Telecommunication System and the Global Data processing System over the past decade had made it possible for members in the developed world to provide grid point information in digital form for computer flight planning. Consideration of a proposal to make this information available for use by airlines in all regions of the

world was presented. The World Weather Watch was dependent upon surface and upper air observations in all parts of the world. In addition, commercial shipping provided essential observations in oceanic areas and airlines provided aircraft reports on intercontinental flights in accordance with procedures developed by ICAO regional air navigation agreements. Author

**N83-24069#** Ecole Nationale Superieure des Telecommunications, Paris (France). Dept. Systemes et Communications.
**STUDY OF CLOUDING BY ANALYSIS OF SEQUENCES OF SATELLITE IMAGES. APPLICATION TO THE EVALUATION OF GLOBAL SOLAR RADIATION ON THE GROUND Ph.D. Thesis [ETUDE DE L'ENNUAGEMENT PAR ANALYSE DE SEQUENCES D'IMAGES DE SATELLITE. APPLICATION A L'EVALUATION DU RAYONNEMENT SOLAIRE GLOBAL AU SOL]**
Daniel Cano 1982 205 p refs In FRENCH
(ENST-E-82009) Avail: NTIS HC A10/MF A01

Variations of the numerical value of each elementary part of images of the METEOSAT satellites are examined. These variations can be caused either by the movement of an object which occupies a different position in respect to its environment on two successive images (clouds), or by the evolution of a value of the physical magnitude in a given point between two instants. For images taken in the domain of long visible waves, the variations to be considered are essentially incident solar rays in the direction of the height of the Sun. The presence of a cloud at a point can be interpreted as a perturbation of the apparent evolution of physical magnitudes at this point. This interpretation permits obtaining quantitative estimations of beclouding. Different methods of evaluating total radiation to Earth from nebulosity data are examined and a purely statistical method is presented which is based on the hypothesis of a linear correlation between total hourly irradiation to Earth and a continued index of beclouding determined from satellite images. Transl. by A.R.H.

**N83-24070#** Swedish Space Corp., Solna.
**DOPPLER SODAR FOR WIND MEASUREMENTS**
Soeren Salomonsson (Uppsala Univ., Sweden) 6 Dec. 1982 56p refs Original contains color illustrations
(FL8-2) Avail: NTIS HC A04/MF A01

Measurements of mean wind speed and direction during 10 and 60 min obtained by a 3-axis monostatic Doppler sodar, are discussed in relation to simultaneous measurement by in situ sensors on a 145 m tower. It is found that the sodar operated satisfactory during the whole experiment and provided reliable wind data also in light rain. Maximum wind speeds were 15 m/s. The highest range was 875 m which was obtained during a period of an elevated inversion. A system for online transmission of sodar data from the test site to a central computer was tested successfully. An automatic weather station was modified for this operation. E.A.K.

**N83-24071#** International Meteorological Inst., Stockholm (Sweden).
**[ACTIVITIES REPORT OF THE INTERNATIONAL METEOROLOGICAL INSTITUTE IN SWEDEN] Annual Report, Jul. 1981 - Jun. 1982**
Nov. 1982 40 p refs Sponsored by Swedish Government, Belgium Ministere de l'Education Nattionale et de la Culture, National Swedish Environment Protection Board, Scientific Committee on Problems of the Environment, Swedish Board for Space Activities, Swedish Natural Science Research Council
(AR-81-82; ISSN-0349-0068) Avail: NTIS HC A03/MF A01

Several areas of meteorology are addressed including: dynamical meteorology, climatology, geophysical fluid dynamics, chemical meteorology, biogeochemistry, and atmospheric physics. Author

**N83-24072#** University of Central Florida, Orlando. Dept. of Mathematics and Statistics.
**EVALUATION OF AN OBSERVATION-BASED CLIMATOLOGY MODEL FOR PREDICTING VISIBILITY FOR DATA-VOID LOCATIONS IN GERMANY**
S. J. Bean and P. N. Somerville Hanscom AFB, Mass. AFGL 6 Jul. 1982 17 p refs
(Contract F19628-82-K-0001; AF Proj. 6210)
(AD-A123998; AFGL-TR-82-0187; SR-1) Avail: NTIS HC A02/MF A01 CSCL 04/2

An observation based climatological model for predicting visibility in data void locations was evaluated. Two methods are used: (1) a model based on data from 30 stations is evaluated using a second set of 30 stations; and (2) the model is evaluated by sample reuse. The model gives good results for estimating visibility results for nearly all of the stations. GRA

**N83-24073#** Army Cold Regions Research and Engineering Lab., Hanover, N. H.
**SUPPRESSION OF ICE FOG FROM THE FORT WAINWRIGHT, ALASKA, COOLING POND**
Kerry E. Walker and Walter Brunner Oct. 1982 39 p refs
(AD-A123069; CRREL-SR-82-22) Avail: NTIS HC A03/MF A01 CSCL 13/2

Ice fog near the Ft. Wainwright cooling pond creates a visibility hazard. Observations show a substantial reduction in visibility along both private and public roadways in the path of the cooling pond's ice fog plume. This reduction in visibility increases as the ambient air temperature decreases. Visibility was less than 215 m (700 ft) on the Richardson Highway on the average of 8 days for each of the 3 data years. Data collected during the winters of 1979-80, 1980-81 and 1981-82 statistically show that use of a monomolecular film evaporation suppressant, hexadecanol (C16H-33OH), on the pond to reduce ice fog is ineffective. There is an immediate need for a driver warning system when visibility is affected by the ice fog. Author (GRA)

**N83-24074#** Naval Oceanography Command Detachment, Asheville, N.C.
**CLIMATIC PUBLICATIONS**
Nov. 1982 12 p
(AD-A123076) Avail: NTIS HC A02/MF A01 CSCL 04/2

These summaries constitude a series of compilations which are world-wide in scope. It consists of climatological summaries for selected airfields and for the climatic areas in which they are located. The series includes data for approimately 4,000 stations and consist of 12 volumes. Copies of these volumes are available from the Defense Technical Information Center (DTIC) or the National Technical Information Service (NTIS). The pages are generally self-explanatory with an introduction in each volume. In this summary series, the 'period of record' varies considerably for any given station between particular elements summarized. For example, the period of record for temperature may not be the same as that for cloud cover. This fact renders the normal use of numbers in the columns under the summaries meaningless. Hence, a letter is utilized under the World-Wide Airfield Summary Column in an attempt to provide the specific volume of the series in which a station is located. GRA

**N83-24075#** Hawaii Univ., Honolulu.
**MEAN SURFACE FLOW FOR TROPICAL PACIFIC, VOLUME 3 Final Report**
James C. Sadler Oct. 1982 26 p
(AD-A123032; AD-E850220; AWS-TR-215-Vol-3) Avail: NTIS HC A03/MF A01 CSCL 04/2

This is a set of twelve monthly meteorological charts of mean global tropical wind fields for the Pacific. This revised data includes extensive ship data obtained from ship logs. Wind steadiness and velocity are given for each two-and-a-half degree grid points. GRA

**N83-24076#** Air Weather Service, Scott AFB, Ill.
**INDEX OF AIR WEATHER SERVICE TECHNICAL PUBLICATIONS. HEADQUARTERS AWS AND SUBORDINATE UNITS**
Jul. 1982 117 p Supersedes AWS/TI-81/001
(AD-A123033; AD-E850219; AWS/TI-82/001; AWS/TI-81/001) Avail: NTIS HC A06/MF A01 CSCL 04/2

This index lists technical publications of the US Air Force Air Weather Service including its subordinate units. These units include the Air Force Global Weather Central, US Air Force Environmental

Technical Applications Center, 1st Weather Wing, 2nd Weather Wing, 3rd Weather Wing, 5th Weather Wing, and 7th Weather Wing. GRA

**N83-24077#** Science Applications, Inc., Monterey, Calif.
**TERRAIN ADJUSTED TROPICAL CYCLONE WIND PROBABILITIES Final Report**
Jerry D. Jarrell Monterey, Calif. Naval Environmental Prediction Research Facility Dec. 1982 21 p refs
(Contract N00228-81-C-H361; W0513CC00)
(AD-A122908; NEPRF-CR-82-14) Avail: NTIS HC A02/MF A01 CSCL 04/2

A problem involving overestimates of tropical cyclone wind probabilities for locations that are heavily terrain-influenced is described. Previous studies on this topic are reviewed. A method is described to adjust wind probabilities for terrain, and it is applied for the two Navy ports of Cubi Point, RP, and Yokosuka, JA. Probabilities with and without terrain modifications are tested, and the results are analyzed and compared. The study concludes that the resulting lower wind probabilities are a substantial improvement over the unmodified probabilities. Author (GRA)

**N83-24078#** Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
**MODELS FOR GENERATING DAYLIGHT AND SUNLIGHT AVAILABILITY DATA FOR THE UNITED STATES**
C. L. Robbins and K. C. Hunter Sep. 1982 14 p refs Presented at Passive and Hybrid Solar Energy Update Conf., Washington, D.C., 15 Sep. 1982
(Contract DE-AC02-77CH-00178)
Avail: NTIS HC A02/MF A01

The exteroir illuminance level and the frequency and duration of sunlight are important elements in the design, analysis and evaluation of daylighting systems in buildings. The daylighting laboratory of the Solar Energy Research Institute (SERI) is establishing daylight and sunlight availability data for select US cities. An overview of the mathematics and a sample of the daylight and sunlight availability data are presented. DOE

**N83-24079#** Oak Ridge National Lab., Tenn.
**SYSTEMATIC ANALYSIS OF CLIMATIC-MODEL SENSITIVITY TO PARAMETERS AND PROCESSES**
Matthew C. G. Hall and Dan G. Cacuci 1982 22 p refs Presented at the 4th Symp. on Climate Processes: Sensitivity to Solar Irradiance and CO-2, Palisades, N.Y., 25 Oct. 1982
(Contract W-7405-eng-26)
(DE83-001897; CONF-821054-1) Avail: NTIS HC A02/MF A01

A demonstration is presented of the adjoint method of sensitivity analysis on a radiative-convective climate model with a diurnal cycle. A single adjoint calculation, which requires about the same computation time as the original model, suffices to calculate sensitivities of average surface air temperature to all 312 model parameters. The sensitivities accurately predict the effect on average surface air temperature of small variations in the model parameters. Relative sensitivities rank the importance of all the parameters, the most important parameters being those that characterize solar radiation and determine transmission functions. The uncertainties in the model results are expressed formally in terms of all the sensitivities and parameter covariances. For this model, a 10% standard deviation in surface albedo causes the increase in average surface air temperature after doubling CO2 to have a standard deviation of 0.24 deg K about the expected value of 1.66 deg K. DOE

**N83-24080#** Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
**AVAILABILITY OF SUNLIGHT IN THE UNITED STATES**
Claude L. Robbins and Kerri C. Hunter Jul. 1982 5 p refs Presented at the Intern. Passive and Low-Energy Aternatives Conf., Bermuda, 5-15 Sep. 1982
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE82-018194; SERI/TP-254-1653; CONF-820928-2) Avail: NTIS HC A02/MF A01

A model developed to establish the computed probability of having sunlight in a given hour or for a specific duration of time for select cities in the United States is presented. DOE

**N83-24081#** Brown Univ., Providence, R. I. Dept. of Geological Sciences.
**USE OF PALEOCLIMATIC DATA IN UNDERSTANDING AND POSSIBLY PREDICTING HOW CO SUB 2-INDUCED CLIMATIC CHANGE MAY AFFECT THE NATURAL BIOSPHERE. VOLUME 2, PART 17: ENVIRONMENTAL AND SOCIETAL CONSEQUENCES OF A POSSIBLE CO SUB 2-INDUCED CLIMATE CHANGE**
Thompson Webb, III Jul. 1982 25 p refs
(Contract DE-AS01-79EV-10019)
(DE82-020579; DOE/EV-10019/2-Vol-2-Pt-17) Avail: NTIS HC A02/MF A01

Work and recommendations of over 500 authors and reviewers are summarized. Studies in three main research areas need to be organized and funded to document past changes in climate to help in predicting how future changes may affect the biosphere. The three areas identified for research were: research area I, in which paleoclimatic data will be used to test the results of computer-based climatic models: reseach area II, in which paleoclimatic data will be used to map past patterns of climatic change; and research area III, biospheric changes induced by past climatic changes. DOE

**N83-24082#** World Meteorological Organization, Geneva (Switzerland).
**GUIDE ON THE GLOBAL DATA-PROCESSING SYSTEM**
V. Jurcec, ed., M. Atkins, ed., A. A. Hassan, ed., Jiuen Shi, ed., T. Nitta, ed., and D. Olson, ed 1982 169 p refs
(WMO-305; ISBN-92-63-12305-5) Avail: NTIS MF A01; print copy available at WMO, Geneva

The global data processing system (GOPS) makes available to all members the basic processed data they require both for real-time and non real-time uses. Real time uses are operations in which the information must be received and used or processed within, at most, a few hours after it is generated; these are concerned mainly with daily processing of basic observational data to produce analyses and prognoses for operational use. Non real time uses are operations which can be carried out over a more extended time period; for these it is necessary to lay down standard procedures for the storage and retrieval of all types of observational and processed data. The GDPS is made possilbe through an integrated system of world, regional and national meteorological centers equipped to the maximum degree possible with modern facilities, including high-speed computers. The GDPS is a world wide system composed of national facilities and other processing facilities provided by individual members and coordinated through the direction of the WMO commission for basic systems and its working group on the global data-processing system. Coordination through this working group is confined to the global and regional levels. E.A.K.

**N83-24083#** Stockholm Univ. (Sweden). Dept. of Meteorology.
**ATMOSPHERIC VISIBILITY IN THE SCANDANAVIAN MOUNTAINS: IS THERE A SECULAR TREND**
Christer Morales and Henning Rodhe 30 Dec. 1982 21 p refs
(CM-62; ISSN-0280-445X) Avail: NTIS HC A02/MF A01

Visibility observations covering the period 1907 to 1973 from mountain sites of central Scandinavia were investigated. There was no clear indication of any long term trend in visibility corresponding to the increase in anthropogenic sulphur emissions in northern Europe during the same period. Uncertainties associated with the visibility observations and the relatively small contribution of aerosol particles to the extinction of visible light at three sites make it unlikely that such a trend would be discernible. It is recommendably that similar investigations should be carried out for sites with good quality visibility observations located close to the major industrial areas on the European continent. E.A.K.

**N83-24084#** National Oceanic and Atmospheric Administration, Seattle, Wash. Marine Environmental Lab.
**ENERGY FLUXES OVER THE EASTERN TROPICAL PACIFIC OCEAN, 1979-1982**
Ronald K. Reed Aug. 1982 22 p refs
(PB83-138305; NOAA-TR-ERL-PMEL-37) Avail: NTIS HC A02/MF A01 CSCL 04B

Weather observations and measurements of insolation were made aboard the NOAA ships Oceanographer and Discoverer during the Equatorial Pacific Ocean Climate Studies work in the eastern tropical Pacific from 1979 to 1982. These observations and computed fluxes of net longwave radiation, latent heat, and sensible heat are documented and presented. Insolation was the dominant heat flux, and latent heat loss was typically much greater than net long-wave radiation or sensible heat loss. The largest values of net surface flux occurred during periods of minimal cloud cover and weak winds. Comparisons of net surface heat flux and changes in oceanic heat content in the region 4 degrees-12 degrees N showed an inexact balance, but the results indicate that the surface heat flux is an important variable during normal oceanic conditions. Author (GRA)

**N83-24085#** National Oceanic and Atmospheric Administration, Washington, D. C. Earth Satellite Service.
**TOTAL PRECIPITABLE WATER AND RAINFALL DETERMINATIONS FROM THE SEASAT SCANNING MULTICHANNEL MICROWAVE RADIOMETER (SMMR)**
John C. Alishouse May 1982 42 p refs
(PB83-138263; NOAA-TR-NESS-90) Avail: NTIS HC A03/MF A01 CSCL 04B

Three of the SEASAT Scanning Multichannel Microwave Radiometers (SMMR) five frequencies can be used to determine the total precipitable water in the atmosphere, the liquid water content, and the rainfall rate. In addition, two distinct algorithms were used to derive geophysical parameters from brightness temperature. Comparisons with surface observations from the Gulf of Alaska SEASAT Experiment and with other selected sources were made for both algorithms. Generally, very good agreement was found between satellite and radiosonde observations of total precipitable water. An estimate of the precision of radiosonde derived total precipitable water amounts was made. Comparisons of precipitation occurrence as determined from the SMMR and surface observations also were made. In the tropics, very good agreement is found between satellite and surface observations. Author (GRA)

**N83-24086#** National Center for Atmospheric Research, Boulder, Colo. Atmospheric Technology Div.
**CLOUD PARTICLE MEASUREMENT SYMPOSIUM: SUMMARIES AND ABSTRACTS**
Darrel Baumgardner, ed. and James E. Dye, ed. Sep. 1982 112 p refs Symp. held at Boulder, Colo., 4-7 May 1982
(Grant NSF ATM-77-23757)
(PB83-134437; NCAR/TN-199) Avail: NTIS HC A06/MF A01 CSCL 04B

Discussions on instruments being used for cloud particle measurement, in particular, those being manufactured by Particle Measurement System are discussed. The Forward Scattering Spectrometer Probes, the Optical Array Probes, (both 1-D and 2-D), and liquid water content measurement are discussed. Theoretical calculations, calibration techniques, laboratory tests and comparisons, electronic response, ground and airborne comparisons with other instruments, and data processing techniques are discussed. GRA

**N83-24087#** National Weather Service, Silver Spring, Md. Marine Service Branch.
**SELECTED WORLDWIDE MARINE WEATHER BROADCASTS**
Sep. 1982 188 p
(PB83-127852; NOAA-82102706) Avail: NTIS HC A09/MF A01 CSCL 04B

Information on and schedules of marine weather broadcasts in the English language are presented. Data on broadcasts in other languages are included only when English broadcasts are not available in the area. GRA

**N83-23747#** European Space Agency, Toulouse (France). Meteosat Div.
**METEOROLOGICAL DATA PROVIDED BY SPACE SYSTEMS**
John Aasted *In its* Solar Energy 1982: Resources, Technol., Potential Nov. 1982 p 21-26 refs (For primary document see N83-23743 13-44)
Avail: NTIS HC A12/MF A01

**N83-23748#** Centre National de la Recherche Scientifique, Valbonne (France). Lab. d'Ecothermique Solaire.
**STATISTICAL STUDY OF CLIMATIC DATA ADAPTED TO THE SIMULATION OF SOLAR SYSTEMS**
M. Schneider and X. Berger *In* ESA Solar Energy 1982: Resources, Technol., Potential Nov. 1982 p 27-31 refs (For primary document see N83-23743 13-44)
Avail: NTIS HC A12/MF A01

# 48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

**N83-24088#** Nova Univ., Dania, Fla.
**RECENT PROGRESS IN EQUATORIAL OCEANOGRAPHY: A REPORT OF THE FINAL MEETING OF SCOR WORKING GROUP 47**
Julian P. McCreary, Jr., ed., Dennis W. Moore, ed. (Hawaii Univ., Honolulu), and Janet M. Witte, ed. NYIT Press Dec. 1981 451 p refs Meeting held in Venice, 27-30 Apr. 1981
(Grant NA81AA-D-00051)
Avail: NTIS HC A20/MF A01

Meteorology, upper tropical ocean, deep equatorial ocean, western boundary currents are considered. For individual titles, see N83-24089 through N83-24132.

**N83-24089#** Florida State Univ., Tallahassee. Dept. of Meteorology.
**COOLING OF THE ARABIAN SEA AND THE ONSET-VORTEX DURING 1979**
T. N. Krishnamurti *In* Nova Univ. Recent Progr. in Equatorial Oceanog. Dec. 1981 p 1-12 refs Sponsored in part by NOAA (For primary document see N83-24088 13-48)
(Grant NSF ATM-78-19363)
Avail: NTIS HC A20/MF A01

During the GARP Monsoon Experiment (1979) the rapid cooling of the Arabian Sea commenced very soon after the onset of strong winds over the Arabian Sea. The region between 10 deg and 15 deg N experienced a strong cooling quite far east of the regions of coastal upwelling. The fields of winds, wind stress, wind stress curl, and composite sea surface temperature suggest that a part of the cooling was initiated by the strong winds over the central and eastern Arabian Sea during this period as the onset commenced and the onset vortex formed. The evolution of the cooling is somewhat similar to that seen in the wake of hurricanes. In this study a critical period of cooling during 17 days is analyzed from a variety of surface and space-based platforms to obtain the latitude time sections of relevant parameters. Author

**N83-24090#** Wisconsin Univ., Madison. Center for Space Sciences and Engineering.
**INDIAN OCEAN SURFACE FORCING DURING THE GLOBAL WEATHER EXPERIMENT**
John A. Young *In* Nova Univ. Recent Progr. in Equatorial Oceanog. Dec. 1981 p 13-22 refs (For primary document see N83-24088 13-48)
(Contract NOAA-7-35217; Grants NSF ATM-78-21873; NSF ATM-78-25503; NSF ATM-79-13097)
Avail: NTIS HC A20/MF A01

Monsoon circulation during one complete annual cycle using the GOES satellite over the Indian Ocean is discussed. Author

**N83-24091#** Cologne Univ. (West Germany). Inst. fuer Geophysik und Meterologie.
**LARGE-SCALE METEOROLOGICAL INFLUENCE ON THE ATLANTIC EQUATORIAL UPWELLING DURING FGGE: PRELIMINARY RESULTS**
Peter Speth and Hans-Juergen Panitz *In* Nova Univ. Recent Progr. in Equatorial Oceanog. Dec. 1981 p 23-28 refs (For primary document see N83-24088 13-48)
Avail: NTIS HC A20/MF A01

The surface currents in the equatorial Atlantic consist of the eastward North Equatorial Countercurrent, the westward North Equatorial Current to the north and the westward South Equatorial Current to the south. The subsurface, eastward Equatorial Undercurrent (EUC) flows symmetrically about the equator. The observed meandering of the EUC is explained by several theories which rely either on the barotropic instability properties of westward zonal jets or trapped equatorial response to variation in equatorial winds. This wave would be generated by increased westward wind stress in the western Atlantic. These are our theoretical working hypotheses; with respect to these mechanisms the influence of the atmospheric motion on the ocean circulation during FGGE is investigated. Author

**N83-24092#** Hawaii Univ., Honolulu. Dept. of Meteorology.
**METEOROLOGY OF THE TROPICAL PACIFIC DURING FGGE**
James C. Sadler and Bernard J. Kilonsky *In* Nova Univ. Recent Progr. in Equatorial Oceanog. Dec. 1981 p 29-40 refs (For primary document see N83-24088 13-48)
(Grant NSF OCE-80-19012)
Avail: NTIS HC A20/MF A01

We are documenting the large-scale meteorology of the tropical Pacific during FGGE with concentration on the longitudes of the Hawaii-Tahiti Shuttle Experiment between 150 W and 158 W. Monthly means of the winds, clouds and rainfall and their anomalies comprise the major effort. Observations from satellites will be the major data source since the more conventional observations from islands and ships, even during FGGE, will be insufficient for the task. The final FGGE meteorology data base is not yet available; therefore, in this short presentation we show examples of climatology and demonstrate the use of the low-level cloud motion vectors from satellites (sawins) to: (1) monitor the trade wind system, (2) obtain anomalies of the low-level flow, and (3) produce a first guess surface wind field. Author

**N83-24093#** Miami Univ., Fla. School of Marine and Atmospheric Science.
**PYCNOCLINE TOPOGRAPHY IN THE WESTERN EQUATORIAL INDIAN OCEAN**
D. Rudolf Quadfasel *In* Nova Univ. Recent Progr. in Equatorial Oceanog. Dec. 1981 p 41-46 refs Sponsored in part by the U.K. National Environmental Research Council (For primary document see N83-24088 13-48)
(Grant NSF ATM-78-24585)
Avail: NTIS HC A20/MF A01

Monthly maps of the mean 20 C isotherm topography were compiled from historical data for an area reaching from 15 S to 15 N and from the East African coast to 65 E. Previous investigations showed that the near-surface circulation is shallow, and good agreement was found between the surface currents and the gradients in the 20 C isotherm topography. Wyrtki found that intensive thermocline upwelling occurring during the transition phases between the monsoon periods could be related to a narrow jet flowing eastward along the equator during these times. This jet partly draws its water supply from the upper layer of the western side of the Indian Ocean. Author

**N83-24094#** Institute of Oceanographic Sciences, Birkenhead (England).
**SEASONAL CHANGES OF THE ZONAL PRESSURE GRADIENT IN THE EQUATORIAL ATLANTIC WEST OF 10 DEG W DURING THE FGGE YEAR**
Hans W. Lass (Inst. fuer Meereskunde), Vitaly A. Bubnov (USSR Academy of Sciences), J. M. Huthnance, Bruno Voituriez (Office de la Recherche Scientifique et Technique Outre-Mer), J. Meincke (Kiel Univ.), A. deMesquita (Univ. de Sao Paulo), Eli J. Katz (Lamont-Doherty Geological Observatory), and F. Ostapoff (NOAA) *In* Nova Univ. Recent Progr. in Equatorial Oceanog. Dec. 1981 p 49-53 refs (For primary document see N83-24088 13-48)
Avail: NTIS HC A20/MF A01

The zonal pressure gradient in the Atlantic Ocean between approximately 40 W and 10 W within two degrees latitude of the equator, based on 970 STD and Nansen casts made by expeditions from different countries between August 1978 and March 1980. Most of the expeditions were carried out as part of the Global Weather Experiment (also called FGGE). The validation of the hydrographic data and the calculation of the dynamic height relative to the 500 dbar level was made by the different laboratories without an intercalibration. This development of dynamic height lies in the range of the standard deviation of meridional and zonal averages over a few degrees extent. It is assumed that the systematic errors in temperature and salinity estimations from the different expeditions are smaller than the above-mentioned errors. Author

**N83-24095#** Kiel Univ. (West Germany). Inst. fuer Meerskunde.
**A COMPARISON OF HYDROGRAPHIC FEATURES OBSERVED IN THE EQUATORIAL ATLANTIC DURING FGGE USING A CONVENTIONAL CTD AND A TOWED SYSTEM**
Alexander Sy and Jens Meincke *In* Nova Univ. Recent Progr. in Equatorial Oceanog. Dec. 1981 p 55-60 refs (For primary document see N83-24088 13-48)
Avail: NTIS HC A20/MF A01

The hydrographic structure along the 22 deg W meridian was repeatedly measured between 2 deg S and 3 deg N in order to obtain detailed information on the effects of the Atlantic Equatorial Undercurrent on hydrographic parameters. Author

**N83-24096#** Instituto del Mar del Peru, Callao.
**HYDROGRAPHIC FEATURES OFF PERU IN 1979-1980**
Salvador Zuta and Juan Quispe (Direccion de Hudrografia y Navegacion de la Marina) *In* Nova Univ. Recent Progr. in Equatorial Oceanog. Dec. 1981 p 61-74 refs Sponsored in part by NOAA (For primary document see N83-24088 13-48)
Avail: NTIS HC A20/MF A01

Data sources, temperature and salinity at the sea surface, coastal stations, surface temperature, thermal structure, sea level observations, and surface flows are discussed. N.W.

**N83-24097#** Florida State Univ., Tallahassee. Mesoscale Air-Sea Interaction Group.
**AN OCEAN MODEL WHICH PREDICTS EL NINO**
Antonio J. Busalacchi and James J. O'Brien *In* Nova Univ. Recent Progr. in Equatorial Oceanog. Dec. 1981 p 75-86 refs (For primary document see N83-24088 13-48)
(Grant NSF ATM-79-20485)
Avail: NTIS HC A20/MF A01

An ocean model which can reproduce the timing and relative amplitude of El Nino events off South American in the Pacific Ocean is developed. The model demonstrates that knowledge of the atmospheric wind field allows the simulation of the seasonal and interannual variability of the upper ocean currents in tropical latitudes. Author

**N83-24098#** Academy of Sciences (USSR), Kaliningrad. Inst. of Oceanology.
**SOME FEATURES OF SYNOPTIC AND SEASONAL VARIABILITY OF THE LOMONOSOV CURRENT**
Vitaly A. Bubnov *In* Nova Univ. Recent Progr. in Equatorial Oceanog. Dec. 1981 p 87-96 refs (For primary document see N83-24088 13-48)
Avail: NTIS HC A20/MF A01

An oceanographic polygon was organized for studying variability of hydrophysical fields in the equatorial Atlantic. The observations were carried out at meridional sections across the equatorial zone

along 18 deg 30 min W and 23 deg 30 min W between 2 deg S and 2 deg N in spring and in summer. Five moorings with 6 to 8 current recorders BPV-2 and CIITT in the upper 500 m layer were set at each meridional section. The measurements from moorings were continuous from 46 to 50 days during both spring and summer phases. Hydrographic sections with measurements of temperature, salinity and dissolved oxygen down to a depth of 500 M were episodically made at both meridional sections. The hydrographic survey of the central Atlantic region bounded by 16 deg W and 26 deg W meridians and 2 deg N and 2 deg S parallels was carried out at the end of the summer observational phase. The survey included 9 meridional sections space at 1 deg 15 min intervals, longitude. The distance between stations at sections was 20 nautical miles in the zone from 1 deg N to 1 deg S miles beyong this zone. Observations were made down to a depth of 500 m. S.L.

**N83-24099#** Lamont-Doherty Geological Observatory, Palisades, N. Y.

**THE SEASONAL TRANSPORT OF THE EQUATORIAL UNDERCURRENT IN THE WESTERN ATLANTIC DURING FGGE**

Eli Joel Katz *In* Nova Univ. Recent Progr. in Equatorial Oceanog. Dec. 1981 p 97-103 refs (For primary document see N83-24088 13-48)

Avail: NTIS HC A20/MF A01

Twenty-five current profiling sections were made across the equator between 25 deg W and 33 deg W. The data are combined and collapsed onto a single year to infer the seasonal cycle of the equatorial undercurrent in that region. A continuous wind record, assumed to be typical of the area, describes the year long forcing. The wind record is from St. Peter and St. Paul Rocks, at 1 deg N 29 deg W. The earlier half of the year shows the effect of the annual southerly migration of the ITCZ towards/past the equator. This results in a slow decrease in wind speed to a near zero minimum and then a rapid, one month build up. In the latter half of the year, the wind blows stronger and steadily, and the resulting zonal wind stress is 0.5 dyn/sq cm + or - 20% to the west. This pattern closely follows the monthly averaged winds from ship observations. The oceanic response to this seasonal wind is described by two measures: the average near surface zonal current between 2 deg N and 2 deg S and the eastward volume transport of the equatorial undercurrent; computed within the 20 cm/s isotach, relative to 500 m and in the 0 to 200 m depth interval. S.L.

**N83-24100#** Hawaii Univ., Honolulu.

**PROFILE MEASUREMENTS IN THE EQUATORIAL PACIFIC**

Eric Firing *In* Nova Univ. Recent Progr. in Equatorial Oceanog. Dec. 1981 p 105-110 refs (For primary document see N83-24088 13-48)

Avail: NTIS HC A20/MF A01

Over 800 current profiles were made between 10 deg N and 4 deg S. Stations were occupied every half degree of latitude from 3 deg N to 3 deg S, and every degree elsewhere, along 150 W, and 158 deg W. Although these meridional sections encompass the north equatorial counter-current as well as the undercurrent (EUC) and much of the south equatorial current (SEC). Attention is focussed on the EUC and the SEC within 3 deg of the equator. The mean shear structure of these currents is shown, along with the distribution of variance. A preliminary comparison is made of the low frequency behavior of the currents, the zonal wind component, and the zonal pressure gradient. The Duing profiler was used to make relative profiles to 500 m with 4 m resolution. Since it was usually not possible to measure the absolute motion of the ship, the average velocity from 300 m to the bottom of the profile was chosen as a reference and subtracted from the profile. Previous absolute current measurements in the Pacific indicate that the error in zonal velocity due to this choice of reference is typically 10 to 15 cm/sec and could occasionally be as high as 30 cm/sec. S.L.

**N83-24101#** Office de la Recherche Scientifique et Technique Outre-Mer, Brest (France).

**MEASUREMENTS IN THE EQUATORIAL CURRENT OF THE ATLANTIC AND PACIFIC OCEANS**

Francois Jarrige and Pierre Rual *In* Nova Univ. Recent Progr. in Equatorial Oceanog. Dec. 1981 p 111-120 (For primary document see N83-24088 13-48)

Avail: NTIS HC A20/MF A01

Surface waters were warmer than usual at the equator and the upwelling less intense. In April, the 28 C isotherms extended southward as far as 8 S at 4 W and 10 W. April is the warmest month, but it is also the end of the period when the wind is weak (2 to 3 m/s) and has an eastward component (190 deg). In May, June, and July the wind builds up in speed (5 to 7 m/s) and rotates to the west (170 deg). During the same time the surface cools down in the whole area with a minimum between the equator and 3 S. The cooling rate seems to fluctuate in accordance with the variations of the wind speed. In August, the wind rotates back to the east (190 deg) but remains strong (5 m/s), and the surface waters start to warm up again at a very constant rate until April. During that period the wind maintains an eastward component, but in November its intensity starts to decrease regularly until February. The wind, recorded on a buoy at 0 deg to 4 W between January and July, confirms very well the historical data, except that it was rotated, off the mean, by 20 deg to the west. S.L.

**N83-24102#** Kiel Univ. (West Germany). Inst. fuer Meerskunde.

**MOORED CURRENT METER MEASUREMENTS IN THE EQUATORIAL ATLANTIC DURING FGGE**

Eberhard Fahrbach and Jens Maincke *In* Nova Univ. Recent Progr. in Equatorial Oceanog. Dec. 1981 p 121-126 refs (For primary document see N83-24088 13-48)

Avail: NTIS HC A20/MF A01

From 27 January to 23 June 1979 the German R. V. Meteor worked within. On a section along 22 W from 3 N to 2 S. Along this, five current meter moorings were deployed. Taut wire techniques with surface buoys were used in order to measure wind and near-surface currents. At 15 m depth, VACM's (sampling interval 7.5 min) were used and below that depth Aanderaa current meters (sampling inteval 30 min) were used. Some of the time series are shown as low pass filtered data (120 h half power point). S.L.

**N83-24103#** National Center for Atmospheric Research, Boulder, Colo.

**RECENT MODELS OF THE EQUATORIAL UNDERCURRENT**

Albert J. Semtner, Jr. *In* Nova Univ. Recent Progr. in Equatorial Oceanog. Dec. 1981 p 127-133 refs (For primary document see N83-24088 13-48)

Avail: NTIS HC A20/MF A01

Five models of the equatorial undercurrent, as portrayed in steady (or statistically steady) stratified oceans are surveyed. The characteristics of the models are indicated. Particular attention is paid to the various specifications of vertical and horizontal diffusion. In the linear models, these are specified to allow analytical solutions. In one nonlinear model small lateral friction and small vertical friction permit instabilities in the numerical solutions, whereas in other nonlinear models, larger frictional effects lead to a quasi-steady state. In the linear solutions shown, both models show some of the known aspects of the real undercurrent system (strong eastward jet with westward flow above and below it, upwelling at the equator with surface divergence on either side). The unrealistically strong surface current in one model is due to the lack of a mixed layer; the fact that the meridional circulation does not close off at the undercurrent depth may be due to the linear stratification or to the spatial periodicity of the wind stress. S.L.

**N83-24104#** National Museum of Natural History, Paris (France). Lab. d'Oceanographie Physique.

**DRIFTING BUOY TRAJECTORIES IN THE EQUATORIAL INDIAN OCEAN**

Michele Fieux and Joseph Gonella *In* Nova Univ. Recent Progr. in Equatorial Oceanog. Dec. 1981 p 135-139 refs (For primary document see N83-24088 13-48)

Avail: NTIS HC A20/MF A01

Reversal of the surface circulation twice a year occurs in the Indian Ocean. The reversal of the oceanic circulation is a response to the reversal of the winds, known as the monsoon. At the equator, zonal winds and zonal currents reverse four times a year. Periods of strong eastward flow occur during both monsoon transition periods, followed by periods of no or weak westward flow during the monsoons. Four satellite-tracked drifting buoys located with the ARGOS system were launched at 62 E on the equator. The buoys were drogued at around 12 m in the mixed layer. Two other buoys were launched at the same time around 49 E. One of the buoys was carried along by the Somali current system and came back later in the equatorial jet. Five buoys were swept along by the eastward jet (at speeds between 30 and 60b cm/s), up to the beginning of the SW monsoon. S.L.

**N83-24105#** National Oceanic and Atmospheric Administration, Seattle, Wash. Marine Environment Lab.

**GEOSTROPHIC FLOW AND SURFACE WATER MASSES IN THE CENTRAL PACIFIC**

Bruce A. Taft *In* Nova Univ. Recent Progr. in Equatorial Oceanog. Dec. 1981 p 141-149 refs (For primary document see N83-24088 13-48)

Avail: NTIS HC A20/MF A01

A time series of north-south CTD sections was made across the tropical central Pacific (21 N to 17 S). A representative distribution of stations from one of the monthly cruises is shown. Station spacing is 1 deg of latitude and the coverage between 12 N and 3 S was repeated at three longitudes (158 deg, 153 deg, 150 W). This set of measurements, although coarsely sampled in time, constitutes the first time series over a seasonal cycle which encompases all the components of the tropical circulation in the central Pacific. Of particular interest are the 150 W sections to 17 S because this is the first series of sections which extend across the south equatorial current (SEC) and south equatorial countercurrent (SECC) in the central Pacific. S.L.

**N83-24106#** Scripps Institution of Oceanography, La Jolla, Calif.

**SURFACE CURRENT VARIABILITY IN THE TROPICAL PACIFIC DURING 1979 AND 1980 USING DRIFTING BUOYS**

William C. Patzert and G. J. McNally *In* Nova Univ. Recent Progr. in Equatorial Oceanog. Dec. 1981 p 151-156 ref (For primary document see N83-24088 13-48)

Avail: NTIS HC A20/MF A01

Results from the 62 satellite-tracked drifting buoys deployed as one component of the NORPAX Hawaii/Tahiti Shuttle Experiment are discussed. Although the primary objective of this project was to describe the variations of the near surface flow in the north equatorial countercurrent (NECC) and Current (NEC) on seasonal and shorter time scales, buoys were also deployed in the equatorial waveguide, i.e., 3 deg to 3 deg S. Highlights of some results are: (1) The NECC exhibits strong annual variations in zonal flow, (2) NECC meandering was present during most of the year, and (3) all buoy trajectories reveal inertial motions with amplitudes of + or - 20 cm/s, the same amplitude as the mesoscale and annual signals. S.L.

**N83-24107#** Miami Univ., Fla.

**EQUATORIAL EXCHANGE FROM TRITIUM DATA**

Rana A. Fine and H. Goete Oestlund *In* Nova Univ. Recent Progr. in Equatorial Oceanog. Dec. 1981 p 157-165 refs (For primary document see N83-24088 13-48)

(Grants NSF OCE-77-24039; NSF OCE-78-22120)

Avail: NTIS HC A20/MF A01

Tritium data (GEOSECS and NORPAX) are presented from the equatorial Pacific, Indian, and Atlantic Oceans. In the Atlantic and Pacific Oceans, high-latitude Northern Hemisphere water tagged with bomb tritium extends southward as subsurface tritium maxima. Near the southern boundary of these maxima there is a tritium front, which occurs at about 6 N in the Pacific and at 14 N in the Atlantic and is absent in the Indian Ocean. The subsurface maxima, locations of the tritium fronts, and tritium inventories are vastly different in the three oceans. These differences have implications for the cross equatorial transport and the time scales of mean meridional exchange. S.L.

**N83-24108#** Scripps Institution of Oceanography, La Jolla, Calif.

**VARIATION OF THE PACIFIC NORTH EQUATORIAL COUNTERCURRENT OBSERVED BY SHIPS-OF-OPPORTUNITY**

Gary Meyers, J. R. Donguy (ORSTOM), and D. R. McLain (NOAA) *In* Nova Univ. Recent Progr. in Equatorial Oceanog. Dec. 1981 p 167-178 refs (For primary document see N83-24088 13-48)

Avail: NTIS HC A20/MF A01

Approximately 17 merchant vessels were used during 1979 and 1980 to monitor the tropical Pacific subsurface temperature by expendable bathythermograph (XBT). The ships' routes are shown. The number of equatorial crossings on each route is indicated. The supporting institutions and responsible oceanographers are given. Baroclinic structure observed by these ships in the vicinity of the Pacific North Equatorial Countercurrent is discussed. One ship provided approximately bimonthly sections across the current in the western Pacific on the route between Noumea and Japan. Nine ships provided approximately weekly sections across the current in the central Pacific south of Hawaii. The temporal evolution in strength of the Countercurrent is described and its variability in the western and central Pacific is compared. Author

**N83-24109#** National Oceanic and Atmospheric Administration, Miami, Fla. Oceanographic and Meteorological Labs.

**PHYSICAL OCEANOGRAPHIC CONDITIONS IN THE NEAR-SURFACE WATERS OF THE TROPICAL SOUTH ATLANTIC OCEAN**

Robert L. Molinari *In* Nova Univ. Recent Progr. in Equatorial Oceanog. Dec. 1981 p 179-186 refs Sponsored in part by DOE (For primary document see N83-24088 13-48)

Avail: NTIS HC A20/MF A01

Hydrographic data collected in the tropical South Atlantic Ocean between 25 W and 30 W along the equator from 15 W to 30 W during four cruises (July-August 1978, January-February 1979, July 1979, and February-March 1980) and direct observations of current obtained continuously from satellite-tracked drifting buoys are described. In particular, the seasonal patterns of near surface current, temperature and salinity reveal the annual extremes in distributions of these properties. Some subsurface conditions are also described. Author

**N83-24110*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

**SHALLOW BAROCLINIC INSTABILITY IN THE TROPICAL OCEANS**

Paul S. Schopf *In* Nova Univ. Recent Progr. in Equatorial Oceanog. Dec. 1981 p 189-195 refs (For primary document see N83-24088 13-48)

Avail: NTIS HC A20/MF A01

A linear quasi-geostrophic stability analysis was performed. The stability is dependent on the shears between the first and second layers and between the second layer and the abyss. By computing the maximum growth rate as a function of the shears, the possibility of a shallow baroclinic instability is discovered. This stability is largely dependent on the shear between layers 1 and 2, and quite independent of the speed in layer 2. The scaling of the shears shown is applicable to 4 deg latitude. As in Philander's study, the stability region increases strongly as the equator is approached. This probably explains the advance of the thermal front out to the 4 to 5 deg latitude zone without development of eddies and their rather sudden development at 80 days. Author

**N83-24111*#** Massachusetts Inst. of Tech., Cambridge. Dept. of Meteorology and Physical Oceanography.

**THE VARIABILITY OF EQUATORIAL CURRENTS**

Mark A. Cane *In* Nova Univ. Recent Progr. in Equatorial Oceanog. Dec. 1981 p 197-205 refs (For primary document see N83-24088 13-48)

(Grants NGR-22-009-727; NSF OCE-79-22046)

Avail: NTIS HC A20/MF A01 CSCL 08A

The temporal variations of upper ocean currents along the equator, specially the equatorial undercurrent are discussed. Many mechanisms were proposed as explanations of the steady state undercurrent including vertical mixing, horizontal mixing, thermohaline effects, and nonlinear effects. All of these theories succeed to some extent in simulating some of the observed features of the undercurrent. To distinguish among these ideas, the time variability of equatorial currents was considered. Observations of surface currents, currents in the thermocline, and surface winds at the equator are shown. Author

**N83-24112#** British Columbia Univ., Vancouver. Dept. of Oceanography.
**PACIFIC EQUATORIAL TURBULENCE**
William R. Crawford (Canadian Inst. of Ocean Sciences) and Thomas R. Osborn *In* Nova Univ. Recent Progr. in Equatorial Oceanog. Dec. 1981 p 207-218 refs (For primary document see N83-24088 13-48)
Avail: NTIS HC A20/MF A01

In January and February 1979 a free fall vehicle was deployed at 150 deg W near the equator to sample velocity and temperature microstructure. The airfoil shear probes on the vehicle are able to resolve the peak of the velocity graient spectrum and permit computation of the rate of dissipation of turbulent energy. These measurements indicate maximum values of rate of dissipation of turbulent energy .001 square cm/cubic sec (= .000s1 watts/square m) to be within one-half degree of the equator, above the velocity core of the undercurrent, similar in location to the observed distribution in the Atlantic. However, a secondary maximum, below the core of the undercurrent found in the Atlantic, was not observed in the Pacific. Author

**N83-24113#** National Oceanic and Atmospheric Administration, Seattle, Wash. Marine Environmental Lab.
**EQUATORIAL FINESTRUCTURE IN THE EASTERN PACIFIC**
Stanley P. Hayes and J. M. Toole *In* Nova Univ. Recent Progr. in Equatorial Oceanog. Dec. 1981 p 219-228 refs (For primary document see N83-24088 13-48)
Avail: NTIS HC A20/MF A01

The equatorial ocean was found to exhibit enhanced variance over a large range of vertical scales. In the upper ocean, the vertical structure is dominated by the mean circulation. Currents such as the Equatorial Undercurrent (EUC) and the Subsurface Countercurrents have vertical scales which in midlatitudes are referred to as finestructure. Beneth the EUC, measurements in all equatorial oceans indicate deep, persistent, equatorially trapped jets. This high vertical wavenumber structure of the mean and low frequency equatorial currents is in sharp contrast to the midlatitude observations where low baroclinic modes generally dominate. At smaller vertical scales, vertical displacement variance with vertical wavelengths from 10 to 300 m increased nearly one order of magnitude at the equator. This enhancement, measured below the EUC, was attributed to internal waves. Little information on the time scales of these structures was available. At even smaller vertical scales (vertical wavelength $< 1$ m), microstructure measurements also indicate an equatorial enhancement. Author

**N83-24114#** Office de la Recherche Scientifique et Technique Outre-Mer, Brest (France).
**THE EQUATORIAL UPWELLING IN THE EASTERN ATLANTIC OCEAN**
Bruno Voituriez *In* Nova Univ. Recent Progr. in Equatorial Oceanog. Dec. 1981 p 229-247 refs (For primary document see N83-24088 13-48)
Avail: NTIS HC A20/MF A01

The seasonal equatorial sea surface cooling is as well known feature of the Atlantic Ocean. Strong contrast between the eastern and the western part of the Atlantic Ocean is shown. The sea surface cooling is maximum in the east where, in contrast, the wind stress is the weakest. This questions the local wind as a driving force of the equatorial upwelling in the Gulf of Guinea. Other mechanisms were recently proposed to explain the occurrence of the equatorial cooling of the eastern Atlantic in summer: vertical mixing in the vertical shear between the westward South Equatorial Current (SEC) at surface and the eastward Equatorial Undercurrent (EUC) at subsurface; The response of the equatorial basin to the forcing of the wind in the western Atlantic Ocean, acting to elevate the thermocline in the Gulf of Guinea by means of a Kelvin wave propagating eastwards or by keeping an equilibrium between the zonal pressure gradient and the zonal windstress; or advection from the coastal upwelling occurring along the African coast induced by the forcing of the meridional component of the wind in the eastern Atlantic Ocean. Author

**N83-24115#** Lamont-Doherty Geological Observatory, Palisades, N. Y.
**EQUATORIAL UPWELLING IN THE GULF OF GUINEA AS SEEN BY SST MAPS**
Robert W. Houghton *In* Nova Univ. Recent Progr. in Equatorial Oceanog. Dec. 1981 p 249-257 refs (For primary document see N83-24088 13-48)
Avail: NTIS HC A20/MF A01

As part of the SEQUAL pilot program the Gulf of Guinea thermal structure was analyzed using NOAA/NESS sea surface temperature (SST) maps and expendable bathythermograph (XBT) sections to describe the appearance of cold surface water at the equator. The GOSSTCOMP SST maps for 1979 and 1980 show sudden temperature changes in the Gulf of Guinea. Previous observations suggest that this rapid cooling is not unusual. The resulting frontal structure, with high zonal temperature gradients, may persist for weeks, suggesting that it is not a spurious fluctuation but rather a sudden transition between two steady state configurations. There is interestingly good agreement between the July 8 SST map and the concurrent XBT section. The dashed contours in the July map indicate missing satellite data, so without an XBT section late in June, it is not certain that the temperature changes were quite as rapid as suggested. It is unlikely that these changes are due solely to advection of cold in spite of the suggestive pattern in the mean SST maps. Author

**N83-24116#** Universite de Bretagne Occidentale, Brest Cedex (France). Lab. d'Oceanographie Physique.
**EVIDENCE OF REMOTE FORCING IN THE EQUATORIAL ATLANTIC OCEAN**
Jacques Servain, Joel Picaut, and Jacques Merle *In* Nova Univ. Recent Progr. in Equatorial Oceanog. Dec. 1981 p 259-269 refs (For primary document see N83-24088 13-48)
Avail: NTIS HC A20/MF A01

The coastal and equatorial upwelling in the Gulf of Guinea produced by remote forcing off the coast of Brazil was suggested. The data base is the set of the historical observations from merchant ships. The data were provided by S. Hastenrath on 5 deg square monthly means from 1911 to 1972. The ensity of observations was sufficient only from 1923 to 1938 and from 1964 to 1969. Important conclusions are the following. The variability in the sea surface temperature (SST) of the Guinea Gulf is mostly an equatorial event. By examining the SST anomalies and wind stress anomalies, the effect of local forcing in the Guinea Gulf is weak. On the contrary, the effect of remote forcing from westward wind stress off Brazil is more evident. Cross-correlation and cross-spectrum analysis confirm these results. Temperature sea surface in the Gulf of Guinea lags the remote winds by about one month for all the periods when the cross-correlation is significant. This lag is the time required for a second mode baroclinic Kelvin wave to travel from 30 deg W to the Guinea Gulf. Author

**N83-24117#** Universite de Bretagne Occidentale, Brest Cedex (France). Lab. d'Oceanographie Physique.
**PROPAGATION OF THE SEASONAL UPWELLING IN THE EASTERN EQUATORIAL ATLANTIC**
Joel Picaut *In* Nova Univ. Recent Progr. in Equatorial Oceanog. Dec. 1981 p 271-281 refs (For primary document see N83-24088 13-48)
Avail: NTIS HC A20/MF A01

Upwelling along the cost of the eastern equatorial Atlantic is perplexing. It occurs from July to September each year along the

northern coast of the Guinea Gulf between 3 deg E and 8 deg W, along the southern coast and along the equator east of 20 deg W. This upwelling is not due to advection and is not well related to the local wind. Part of this equatorial and coastal upwelling is produced by an internal Kelvin wave generated by increased easterly winds in the vicinity of the northern coast of Brazil. The Kelvin wave travels along the equatorial waveguide and reflects poleward and westward at the African coast in the form of coastal Kelvin and Rossby waves. This theoretical idea was illustrated with both linear and nonlinear models. Other mechanisms to account for the upwelling were suggested. The present results and those of Servain support the idea that remote wind forcing in the western Atlantic is an important factor affecting the temperature in the Guinea Gulf. Author

**N83-24118#** Office de la Recherche Scientifique et Technique Outre-Mer, Brest (France). Centre Oceanologique de Bretagne.
**REMOTE SENSING OF THE UPWELLING SEASON IN THE EASTERN TROPICAL ATLANTIC OCEAN**
Jean Citeau, B. Piton, and Bruno Voituriez *In* Nova Univ. Recent Progr. in Equatorial Oceanog. Dec. 1981 p 283-292 (For primary document see N83-24088 13-48)
Avail: NTIS HC A20/MF A01

The METEOSAT-1 data for oceanographic research in the Atlantic Ocean are reported: (1) the quality of information brought by raw data, which provides primary users efficient experience in cloudfree areas and in upwelling and frontal zones; (2) the relative stability of the spacecraft on its axis produced images on similar map projections with less distortion, especially in subsatellite areas, and thus enables low cost software and its development on minicomputers; (3) the inertial of the ocean and the availability of images at a regular rate allow their combination on a determined time scale. The suitability of software for upwelling studies as seen at 36,000 km from the Earth, in an area of important cloudiness was determined. Agreement between sea truth measurements and remote sensing data analysis are noted. E.A.K.

**N83-24119#** Office de la Recherche Scientifique et Technique Outre-Mer, Brest (France).
**INTERANNUAL VARIABILITY IN THE EASTERN TROPICAL ATLANTIC DURING THE LAST DECADES**
Phillippe Hisard and B. Piton *In* Nova Univ. Recent Progr. in Equatorial Oceanog. Dec. 1981 p 297-306 refs (For primary document see N83-24088 13-48)
Avail: NTIS HC A20/MF A01

The plentiful 1978 fishery year in the Gulf of Guinea, along the northern coasts of the Ivory Coast, Ghana and Togo, was followed by a severe decline of fishery during 1979. This variation was paralleled by a sharp fluctuation of the coastal summer upwelling intensity which was high during 1978, and moderate during 1979 and was associated with large rainfall variations. The strong dependence of the coastal fishery upon environmental conditions in the Gulf of Guinea was documented since the early 60's; due to the weak upwelling season during 1963, followed by a strong season during 1964. E.A.K.

**N83-24120#** National Oceanic and Atmospheric Administration, Seattle, Wash. Marine Environmental Lab.
**EQUATORIALLY TRAPPED WAVES IN THE GALAPAGOS ARRAY**
Pedro Ripa (Centro de Investigacion Cientifica y Esenanza Superior de Ensenada) and Stanley P. Hayes *In* Nova Univ. Recent Progr. in Equatorial Oceanog. Dec. 1981 p 307-312 refs (For primary document see N83-24088 13-48)
Avail: NTIS HC A20/MF A01

Pressure and temperature gauges were maintained at three sites on the western side of the Galapagos Islands since June 1979. These gauges were deployed at shallow depths. Results of the first 5 month deployment are described. It is found that the major features of the low pass filtered sea level fluctuations can be interpreted in terms of equatorial trapped waves. The first empirical orthogonal function (EOF) of the three pressure records contained almost 95% of the variance. The second EOF mode is antisymmetric about the equator and described by a mixed Rossby gravity wave. It is shown that the observed mixed Rossby gravity wave fit is significant at the 90% confidence level. These two modes described essentially all of the low pass filtered variance which was dominated by oscillations. Spectral peaks with shorter periods appear to be acombination of these EOF structures. These peaks are tentatively identified with the frequencies at which the zonal group velocity of inertial gravity waves vanishes. E.A.K.

**N83-24121#** North Carolina State Univ., Raleigh. Dept. of Marine, Earth and Atmospheric Sciences.
**LOW FREQUENCY VARIABILITY IN THE EQUATORIAL ATLANTIC AND NOTES ON EQUATORIAL WAVE DISPERSION**
Robert H. Weisberg *In* Nova Univ. Recent Progr. in Equatorial Oceanog. Dec. 1981 p 313-322 refs (For primary document see N83-24088 13-48)
Avail: NTIS HC A20/MF A01

Low-frequency v and u component oscillations observed in the eastern quatorial Atlantic main thermocline were discussed by time series of up to 1.5 years duration. A distinct frequency separation was observed between the u and v components with characteristic time scales of 1 month for v and 4-8 months for u. It is shown that kinetic energy distribution functions calculated by ensemble averaging periodograms from three successive 6 month deployments at the 500 m level, integrating over frequency, and then normalizing by variance. Roughly 59% of the u-component variance occurs at time scales greater than 2 months compared to only 11% for the v-component, while 51% of the v-component variance occurs at time scales between 3 weeks and 2 months compared to only 15% for the u-component. E.A.K.

**N83-24122#** Rhode Island Univ., Kingston. Dept. of Oceanography.
**ACOUSTIC MEASUREMENTS OF DYNAMIC HEIGHT AND WIND SPEED IN THE EASTERN EQUATORIAL ATLANTIC**
Laury Miller *In* Nova Univ. Recent Progr. in Equatorial Oceanog. Dec. 1981 p 325-334 refs (For primary document see N83-24088 13-48)
(Grants NSF OCE-76-09786; NSF OCE-78-20396)
Avail: NTIS HC A20/MF A01

The presence of energetic motions in the thermocline on time scales ranging between several days and one year was observed. These motions include equatorially trapped waves at periods of 3-5, 16 and 32 days and as large-scale, seasonal variations in the depth of the thermocline along the equator. The temporal variability of dynamic height at one location in the eastern equatorial Atlantic on the basis of 14 months of Inverted Echo Sounder (IES) measurements were examined. It is shown that many of the low frequency fluctuations which were observed by conventional measurement techniques can be studied by IES. The temporal variability in surface wind speed as determined by measurements of ambient acoustic noise are also examined. E.A.K.

**N83-24123#** Lamont-Doherty Geological Observatory, Palisades, N. Y.
**OBSERVATIONS OF INERTIA-GRAVITY WAVES IN THE ATLANTIC FROM INVERTED ECHO SOUNDERS DURING FGGE**
Silvia Garzoli and Eli Joel Katz *In* Nova Univ. Recent Progr. in Equatorial Oceanog. Dec. 1981 p 335-340 refs (For primary document see N83-24088 13-48)
Avail: NTIS HC A20/MF A01

The inverted echo sounder (I.E.S.) which appears to be a good method of detecting inertia-gravity waves (I.G.W.), with large vertical scale, in the oceans is discussed. Frequency spectra for the four sounder records are shown. At lower frequencies variable spectral density levels between periods of 2 and 5 days are observed. A spectral peak is centered at 3.75 days at each of the three sounders from the equator. The two sounders from the latter half of the year have either a peak or an elevated amplitude at 2.33 and 2.14 days. The significance of the spectral peak in terms of an organized wave motion in the interior of the ocean is argued on its reproducibility in several power spectra at different locations and on the coherence between two coincident stations.

The coherence spectra for the two nearby and simultaneous sounders are shown. Significant coherence is indicated in a band corresponding to oscillations with 3-4 day periodicity. E.A.K.

**N83-24124#** Nova Univ., Dania, Fla. Oceanographic Center.
**MODELLING DEEP EQUATORIAL JETS**
Julian P. McCreary, Jr. *In its* Recent Progr. in Equatorial Oceanog. Dec. 1981 p 373-380 refs (For primary document see N83-24088 13-48)
Avail: NTIS HC A20/MF A01

The relationship of the depth of equatorial jets to forcing at the ocean surface was investigated. Several models suggest the following: (1) when the forcing is steady, deep equatorial jets do not occur, therefore, they are necessarily a time dependent phenomenon; (2) at low frequencies Kelvin waves are efficiently generated by a zonal wind field, these waves propagate into the deep ocean at a very shallow angle and reflect from the eastern boundary as packets of Rossby waves, and there is no obvious relationship to the surface wind field; (3) at intermediate frequencies Yanai waves are efficiently generated by a meriodional wind field, or by unstable surface currents, these waves radiate into the deep ocean at much steeper angles and do not reflect significantly from the eastern boundary as packets of Rossby waves. It is found that at intermediate frequencies flow patterns in the deep ocean are simple, and there is a direct and obvious relationship to the surface forcing. E.A.K.

**N83-24125#** Institute of Oceanographic Sciences, Wormley (England).
**EVOLUTION OF NEAR-SURFACE FEATURES IN THE SOMALI CURRENT**
John C. Swallow *In* Nova Univ. Recent Progr. in Equatorial Oceanog. Dec. 1981 p 381-386 refs (For primary document see N83-24088 13-48)
Avail: NTIS HC A20/MF A01

The Somali Current which developed in four stages was examined. In April, after the relaxation of the northeast monsoon, the boundary current extended no farther north than the equator. Early in May it moved up the coast to near 3 deg N, turning offshore there. The current strengthened and continued to turn away from the coast at 3 deg to 4 deg N through June and July. In late June, a clockwise loop of current appeared off the Somali Coast at 5 deg to 10 deg N. In mid August, the lower latitude branch of the current migrated up the coast and merged with the northern one. E.A.K.

**N83-24126#** Miami Univ., Fla.
**EVOLUTION OF SEA SURFACE TEMPERATURE PATTERNS IN THE SOMALI BASIN**
Otis B. Brown and Robert H. Evans *In* Nova Univ. Recent Progr. in Equatorial Oceanog. Dec. 1981 p 387-391 refs (For primary document see N83-24088 13-48)
Avail: NTIS HC A20/MF A01

Surface ship of opportunity and satellite remotely sensed sea surface temperature (SST) data were obtained during the summer monsoons of 1976-1980 in the Somali Basin of the northwestern Indian Ocean. Formation of large wedge like areas of cold upwelling water was observed between latitudes 1 deg and 5 deg N and 10 deg and 12 deg N off the East African coast. These cold water wedges form early in the monsoon following wind field onset and later during the mature phase as well. After initial onset, the southerly wedges remain stationary for a time and then move poleward along the coast. In most cases the southern wedge coalesces with the northern wedge. It is also observed that these cold wedges provide a good tracer of both Somali Current separation latitude and great whirl location. It is implied that large scale motion of the Somali current separation region is a recurrent event on annual time scales. E.A.K.

**N83-24127#** Miami Univ., Fla.
**SOMALI CURRENT: OBSERVATIONS AND THEORY**
Ants Leetmaa (NOAA), D. Rudolf Quadfasel, and D. Wilson *In* Nova Univ. Recent Progr. in Equatorial Oceanog. Dec. 1981 p 393-404 ref (For primary document see N83-24088 13-48)
Avail: NTIS HC A20/MF A01

During the spring and summer of 1979 a multiship survey studied the changes in currents along the East African Coast in response to the transition from the northeast to the southwest monsoon. The Somali Current in late April and early May flowed southwestward along the coast from northern Somali to about the equator. South of the equator the East African Coast Current (EACC) flowed northward. The two currents met in the vicinity of the equator and turned offshore to the southeast. With the initial onset of southerly winds in early May, the Somali Current reversed. The flow did not continue up the coast. The second onset of the monsoon took place in mid June. The transport at 3 deg N was 27 Sv in the top 100 m. Farther to the north, northeasterly flow was observed as early as March. With the monsoon onset in June, a strong anticyclonic circulation developed between 5 deg and 10 deg N. E.A.K.

**N83-24128#** Miami Univ., Fla. School of Marine and Atmospheric Sciences.
**THE ONSET OF THE SOMALI CURRENT DURING 1979: HYDROGRAPHIC OBSERVATIONS**
Robert L. Molinari (NOAA), John C. Swallow (Inst. of Oceanographic Sciences), D. Rudolf Quadfasel, Friedrich Schott, and John Bruce (Woods Hole Oceanographic Inst.) *In* Nova Univ. Recent Progr. in Equatorial Oceanog. Dec. 1981 p 405-413 ref (For primary document see N83-24088 13-48)
Avail: NTIS HC A20/MF A01

Hydrographic observations were made in the western Indian Ocean from four ships, prior to and during the Southwest Monsoon wind regime. The data were analyzed to describe the water masses occupying the Somali Basin as well as the temporal evolution of the distribution of these water masses. Two sources of near surface waters were identified. Arabian Sea Water is formed in the northern Indian Ocean where evaporation greatly exceeds precipitation. This water mass is characterized by a high salinity content. Low salinity waters are transported into the Somali Basin by the South Equatorial and Somali Currents. At intermediate depths, the Persian Gulf and Red Sea serve as sources of high-salinity water, while low-salinity waters are formed at both the Subtropical and Antarctic Convergences. A.R.H.

**N83-24129#** Miami Univ., Fla.
**LOW-FREQUENCY CURRENT FLUCTUATIONS OFF SOMALIA DURING THE 1979 SUMMER MONSOON ONSET**
Friedrich Schott and D. Rudolf Quadfasel *In* Nova Univ. Recent Progr. in Equatorial Oceanog. Dec. 1981 p 415-423 refs (For primary document see N83-24088 13-48)
Avail: NTIS HC A20/MF A01

In 1979 the Somali Current developed in the form of two large anticyclonic gyres with an upwelling wedge extending offshore between them. The southern gyre spins up after the first monsoon onset in May, whereas, the northern gyre responds only to the final strong onset in June. This response of the current north of 5 deg N does not occur simultaneously, even on the rather small scales of the near-coastal array. At one mooring station, drastic current changes at both levels occur around June 13, while at the other station, only 70 km farther shoreward, the response does not occur until June 26. The response times of the current in the 100 m to 300 m depth range at the different stations indicate a coastward propagation of the response north of 5 deg N with a phase speed of about 5 cm/sec. The coastal undercurrent weakens when the response phase propagates onto the continental shelf and eventually reverses on the northern position. A.R.H.

**N83-24130#** Woods Hole Oceanographic Institution, Mass.
**SOMALI EDDIES AS OBSERVED BY XBT SECTIONS ALONG TANKER SEA LANES**
John Bruce *In* Nova Univ. Recent Progr. in Equatorial Oceanog. Dec. 1981 p 425-437 refs (For primary document see N83-24088 13-48)
Avail: NTIS HC A20/MF A01

The variations occurring within the temperature field in the

Somali Basin and off the Arabian coast were monitored from October 1975 through December 1979 along a repeated section between 2 deg S and 22 deg N by closely spaced (approximately 15 to 20 nmi) expendable bathythermography stations on the tanker sea lane. Altogether, 55 sections were completed. They indicate the seasonal development of the large anticyclonic eddies formed during the southwest monsoon (May-September), particularly in the Somali Basin. Of these eddies, the large (scale of 400 km to 600 km) eddy in the northern part of the Basin (4 deg N to 12 deg N) and the smaller eddy off Socotra appear to be spun up during each southwest monsoon. During certain years (e.g., 1970, 1976, and 1979), a southern eddy develops off the Somali coast and south of the large northern eddy. Observations during August and September of 1970 and 1979 suggest that the southern eddy flowed northward and coalesced with the northern eddy during a relatively short interval of about two weeks. A.R.H.

**N83-24131#** Princeton Univ., N. J. Geophysical Fluid Dynamics Lab.
**THE SOMALI CURRENT**
George Philander and P. Roy-Delecluse (Lab. d'Oceanographie Physique) *In* Nova Univ. Recent Progr. in Equatorial Oceanog. Dec. 1981 p 443-451 refs (For primary document see N83-24088 13-48)
Avail: NTIS HC A20/MF A01

The response of an equatorial basin to winds that are parallel to the western coast, and that are spatially uniform so that the curl is zero is examined. Uniform cross-equatorial winds with zero curl drive an eastward jet centered on about 4 deg N and westward drift to the south. A western boundary current closes the circulation and is associated with intense upwelling where it turns offshore at about 4 deg N. The tendency of the coastal jet to overshoot is inhibited by winds with a zonal component and by an inclined coast. There is, of course, a vorticity balance at all points in the basin, in particular the region where the jet separated from the coast. However, to attribute the separation of the jet to constraints imposed by the vorticity balance is to confuse cause and effect. The vorticity balance must be consistent with this constraint. A.R.H.

**N83-24132#** National Oceanic and Atmospheric Administration, Miami, Fla.
**THE SOMALI AND BRAZILIAN COASTAL CURRENTS**
David L. T. Anderson (Oxford Univ.), Ants Leetmaa, and Robert L. Molinari *In* Nova Univ. Recent Progr. in Equatorial Oceanog. Dec. 1981 p 453-466 refs (For primary document see N83-24088 13-48)
Avail: NTIS HC A20/MF A01

Several mechanisms which are important at various stages of Somali Current development are noted, particularly the importance of Southern Hemisphere and local winds near the equator in driving the southern branch, which may be quite distinct from the northern branch (this being largely driven by the low level jet). The separation of the southern branch is related to wind stress curvature or the equator. During its linked phase, the Somali Current bears some resemblance to the North Brazil Coastal Current (the flow from 5 deg S to the equator (or just north of it). A.R.H.

**N83-24133*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
**MEASUREMENTS OF SPECTRAL ATTENUATION COEFFICIENTS IN THE LOWER CHESAPEAKE BAY**
William M. Houghton Apr. 1983 36 p refs
(NASA-TP-2130; L-15406; NAS 1.60:2130) Avail: NTIS HC A03/MF A01 CSCL 08J

The spectral transmission was measured for water samples taken in the lower Chesapeake Bay to allow characterization of several optical properties. The coefficients of total attenuation, particle attenuation, and absorption by dissolved organic matter were determined over a wavelength range from 3500 A to 8000 A. The data were taken over a 3 year period and at a number of sites so that an indication of spatial and temporal variations could be obtained. The attenuations determined in this work are, on the average, 10 times greater than those obtained by Hulburt in 1944, which are commonly accepted in the literature for Chesapeake Bay attenuation. Author

**N83-24134*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
**RELATIONSHIPS BETWEEN CHLOROPHYLL DENSITY AND OCEAN RADIANCE AS MEASURED BY U2/OCS: ALGORITHMS, EXAMPLES AND COMPARISON**
Hongsuk H. Kim and William D. Hart Apr. 1983 36 p refs
(NASA-TM-84961; NAS 1.15:84961) Avail: NTIS HC A03/MF A01 CSCL 08A

An ocean atmosphere radiative transfer process computation method which is suitable for determining lower boundary ocean albedo and other radiation components from spectral measurements of upwelling radiance taken from a high altiitude platform is described. The method was applied to a set of color scanner data taken from slope water of the South Atlantic Bight to determine the influence of cholorophyll-a pigments in the sea on the ratio of upwelling radiance to down welling irradiance as a function of wavelength. The resulting chlorophyll concentrations are compared with measurements made by ships stationed along the flight path. Author

# 51 LIFE SCIENCES (GENERAL)

Includes genetics.

**N83-24135*#** National Aeronautics and Space Administration, Washington, D. C.
**CHANGES OF NUCLEIC ACIDS OF WHEAT SEEDLINGS UNDER SPACEFLIGHT CONDITIONS**
K. M. Sytnyk and L. I. Musatenko 12 May 1983 6 p refs Transl. into ENGLISH from Dopovidi Akad. Nauk. Ukrainskoy RSR, Ser. B., Geol. Khim. i Biol. Nauki (USSR), no. 12, 1980 p 76-78 Transl. by Kanner (Leo) and Associates, Redwood City, Calif.
(Contract NASw-3451)
(NASA-TM-77200; NAS 1.15:77200) Avail: NTIS HC A02/MF A01 CSCL 06C

The effects of space flight on the growth of wheat seedlings and their nucleic acid content were studied. It was shown that both space and ground seedlings have almost the same appearance, dry weight and nucleic acid content in the root, coleoptile and leaves. The only difference found is in the RNA and DNA content, which is twice as much in the ground seedling apices as in the space-grown seedlings. Author

**N83-24136*#** National Aeronautics and Space Administration, Washington, D. C.
**LIFE IN MOTION, IN MOTION!**
Ye. A. Kovalenko Mar. 1983 7 p Transl. into ENGLISH from Zdorovye (Moscow), no. 5(317), 1980 p 7-8 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-77202; NAS 1.15:77202) Avail: NTIS HC A02/MF A01 CSCL 06C

A 120 day limited mobility experiment with young male rats and its results, including retarded growth and degenerative changes in the cardiac muscle, are described. A 120 day strict bedrest experiment with 10 human volunteers and its results are described and discussed. Early subjective complaints, subsequent adaptation and eventual progressive changes in excitability and reactivity, reduction in functional capability of the cerebral cortex, and disturbances in water-salt, protein and fat metabolism, including development of precursors of atherosclerosis, as well as poor results of the orthostatic test after 4 months, are presented. These results are explained as applied to sedentary workers and recommendations are given for such persons to exercise in the morning, at work and in the evening in order to prevent hypokinesis and its physical, mental and physiological effects. Author

**N83-24137#** Colorado Univ., Denver.
**AUDITORY EVOKED MAGNETIC FIELDS: A REPLICATION WITH COMMENTS ON THE MAGNETIC P50 ANALOG Interim Technical Report, Nov. 1981 - Oct. 1982**
J. T. Zimmerman, M. Reite, J. E. Zimmerman, and J. Edrich 12 Oct. 1982 13 p refs Presented at 4th Intern. Workshop on Biomagnetism, Rome, Sep. 1982
(Contract N00014-79-C-0383)
(AD-A121621; ITR-7) Avail: NTIS HC A02/MF A01 CSCL 06/16

Auditory evoked magnetic fields (AEFs) and EEG auditory evoked potentials (AEPs) were recorded from left and right auditory cortical regions of 12 normal adult subjects. The magnetic sensor was a figure-eight SQUID gradiometer with a 4 cm baseline oriented so as to be maximally sensitive to a current dipole oriented normal to the Sylvian fissure. Stimuli were 100 msec long 1 kHz tone pips with a modal interstimulus interval of 700 msec delivered at sound pressure levels of 40, 60, 80, and 100 dB. AEF amplitude was found to be related to stimulus intensity in a quadratic fashion, AEP amplitude in a linear fashion. AEFs were of larger amplitude in response to contralateral as compared to ipsilateral stimulation. AEPs did not exhibit such a relationship. In a second experiment right hemisphere AEFs and AEPs in response to contralateral ear stimulation tone in these 12 subjects were combined with similar previous data from 24 subjects, providing a total of 36 subjects, to examine the comparability of the AEP P50 waveform and the AEF P50 analog. The latency of the P50 was found to decrease as a function of increasing stimulus intensity for both AEFs and AEPs but the P50 latency was consistently shorter in magnetic compared to potential recordings. GRA

**N83-24138#** Naval Biodynamics Lab., New Orleans, La.
**ANALYSIS OF SENSORY EVOKED POTENTIALS USING NORMALIZED CROSS-CORRELATION FUNCTIONS AND POLYEXPONENTIAL REGRESSION**
Michael D. Berger Jul. 1982 27 p refs
(AD-A121726; NBDL-81R003; NBDL-82R015) Avail: NTIS HC A03/MF A01 CSCL 06/19

Somatosensory evoked potentials (EPs) produced by stimulation of the dorsal columns were recorded from the cervico-medullary junction of adult Rhesus, and were analysed using normalized cross-correlation functions (NCCFs), simple peak-detection, and RMS amplitude measurement. The NCCF provided measures of latency shift and waveshape change, while the more traditional peak-detection method provided measures of peak latency and peak amplitude. The results of these procedures were plotted as functions of time relative to a single, brief experimental manipulation (impact acceleration of the whole body). Analysis by means of the NCCF was found to be versatile and effective technique, the advantages of which include: measurement of latency shifts with little contamination by moderate changes in waveshape, quantification of subtle waveshape changes, and usefulness under a wide variety of noise conditions. Polyexponential regression analyses were performed on selected plots and were found to be an effective means of reducing of these data. GRA

**N83-24139#** Undersea Medical Society, Inc., Bethesda, Md.
**EFFECT OF CO2 ON MAMMALIAN ORGANISMS**
E. B. Brown, ed. (Oral Roberts Univ.), Cloyd Dake Gull, ed. (Gull (Cloyd Dake) and Associates, Inc.), and Catherine B. Cariston, ed. Dec. 1982 113 p refs Workshop held in Bethesda, Md., 5-6 Jun. 1980
(Contract DE-FG05-80EV-10321)
(DE83-004441; CONF-8006249) Avail: NTIS HC A06/MF A01

The effects of CO2 on mammalian tissue was addressed, including such areas of focus as, increased concentrations of CO2 on plants, elevated CO2 levels in the air breathed by mammals, and the possible carcinogenic properties of very high concentrations of CO2 in the external environment of organs and tissues. For individual titles, see N83-24140 through N83-24148.

**N83-24140#** Department of Energy, Washington, D. C. Carbon Dioxide and Climate Research.
**THE INTERESTS OF THE DEPARTMENT OF ENERGY IN THE EFFECTS OF CO2 ON MAMMALIAN ORGANISMS**
Roger Dahlman *In* Undersea Medical Society, Inc. Effect of CO2 on Mammalian Organisms Dec. 1982 9 p (For primary document see N83-24139 13-51)
Avail: NTIS HC A06/MF A01

The prospect that carbon dioxide from the unrestrained combustion of fossil fuels may be potentially the most important environmental issue facing mankind. Current predictions call for a doubling of atmospheric carbon dioxide as early as 2030. Climate models, using these elevated levels, predict the possibility of significant dislocations in the global distribution of climate. Should such perturbations in the distribution of global temperature, cloudiness, precipitation, and wind occur, then it is clear that there could be major changes in the global physical characteristics of the oceans, and in the extent of the cryosphere. Author

**N83-24141#** National Oceanic and Atmospheric Administration, Silver Spring, Md. Air Resources Labs.
**ATMOSPHERIC CO2 CONCENTRATIONS** c46
Lester Machta *In* Undersea Medical Society, Inc. Effect of CO2 on Mammalian Organisms Dec. 1982 7 p (For primary document see N83-24139 13-51)
Avail: NTIS HC A06/MF A01

The atmospheric CO2 concentrations are an increasing source of concern. The uncertainties in prediction of future levels are due to the validity of the projections. The largest of the potential errors lies in forecasting the results of future energy policies and the manner in which world energy needs are satisfied. B.G.

**N83-24142#** Rutgers Univ., New Brunswick, N. J. Dept. of Horticulture and Forestry.
**METABOLIC EFFECTS OF CO2 IN PLANT TISSUES**
Chaim Frenkel *In* Undersea Medical Society, Inc. Effect of CO2 on Mammalian Organisms Dec. 1982 3 p refs (For primary document see N83-24139 13-51)
Avail: NTIS HC A06/MF A01

Carbon dioxide has been shown extensively to infuence postharvesting nonphotosynthetic plant tissue growth and development, including cell divison, growth promotion, root development, seed germination, fruit ripening, improvement of crop storage, and other processes. The metabolic action of CO2 is of additional interest, particularly because high concentrations of the gas lead to metabolic abnormalities and damage to tissues - for example, lesions and browning and loss of quality in fruits and vegetables. Author

**N83-24143#** Pennsylvania Univ., Philadelphia. Medical Center.
**TOLERANCE AND ADAPTATION TO ACUTE AND CHRONIC HYPERCAPNIA IN MAN** c52
James M. Clark *In* Undersea Medical Society, Inc. Effect of CO2 on Mammalian Organisms Dec. 1982 13 p refs (For primary document see N83-24139 13-51)
Avail: NTIS HC A06/MF A01

Some of the adaptations that occur in man when exposed to environments with relatively high concentrations of CO2 are changes in arterial blood concentration of CO2 (PaCO2), cerebrospinal fluid concentration of CO2 (CSF PCO2), pulmonary ventilation (V sub E(L/min, BTPS)), arterial blood ph (pH sub a), cerebrospinal fluid pH (pH sub csf), arterial plasma bicarbonate (HCO3) sub p, and cerebrospinal fluid bicarbonate (HCO3) sub csf. Of these changes man can directly sense only pulmonary ventilation. There is a normal diurnal shift in man of 2-4 mmHg for PACO2. Some of the variations in data for the experiments we performed are probably due to a year's separation of studies and to possible different diets of the subjects. Author

**N83-24144#** Wisconsin Univ., Milwaukee. Dept. of Physiology.
**SOME PHYSIOLOGIC CHANGES DURING INHALATION OF 1%-6% CO2 IN MAN AND PONY** c52
Hubert Forster *In* Undersea Medical Society, Inc. Effect of CO2 on Mammalian Organisms Dec. 1982 10 p refs (For primary document see N83-24139 13-51)

Avail: NTIS HC A06/MF A01

Elucidation of mechanisms regulating pulmonary ventilation and arterial blood gas and acid-base status during 15 minute inhalation of .03% to 6% CO2 were determined. Secondary interests include the effect of acute CO2 exposure on metabolic rate and tissue storage of CO2. Author

**N83-24145#** Lovelace Foundation for Medical Education and Research, Albuquerque, N. Mex. Dept. of Physiology.
**COMMENTS ON PERMISSIBLE CO2 CONCENTRATIONS IN HUMAN SPACE FLIGHT** **c52**
Ulrich C. Luft *In* Undersea Medical Society, Inc. Effect of CO2 on Mammalian Organisms Dec. 1982 10 p refs (For primary document see N83-24139 13-51)
Avail: NTIS HC A06/MF A01

Space cabin atmosphere and life support systems with regard to permissible CO2 levels in space flight were reviewed. From experience in submarines and in industry it is generally accepted that an accumulation of CO2 in the inspired air of not more than 2%, producing a partial pressure of 15 mmHg, is subjectively acceptable and compatible with normal activities. A series of experiments where the subjects worked on a bicycle ergometer at progressive work loads to the point of exhaustion while breathing air with and without admixture of low concentrations of CO2 in random sequence unknown to the subject were conducted. Author

**N83-24146#** Schaefer (Karl E.), Old Lyme, Conn.
**EFFECT OF CHRONIC EXPOSURE TO LOW CO2 CONCENTRATIONS ON RESPIRATION, ACID-BASE BALANCE, AND TARGET ORGANS** **c52**
Karl E. Schaefer *In* Undersea Medical Society, Inc. Effect of CO2 on Mammalian Organisms Dec. 1982 14 p refs (For primary document see N83-24139 13-51)
Avail: NTIS HC A06/MF A01

The effects of chronic exposure to low levels of CO2 (0.7% to 1% CO2) on submarines were found to be similar to those known to occur in chronic hypercapnia induced by higher CO2 concentrations (1.5%, 2%, and 3% CO2) and consisted of an increase in ventilation based on an enlarged tidal volume. During the later periods of exposure, the ventilatory response to CO2 was found to decline. Acid base parameters (blood pH and bicarbonate) exhibited cyclic changes between periods of 'metabolic' and 'respiratory' acidosis that were approximately 20 days long, in contrast to the two phases of 'uncompensated' and 'compensated' respiratory acidosis observed during chronic hypercapnia produced by exposure to higher CO2 concentrations. The cause for this discrepancy seems to be a different renal regulation in low level hypercapnia. Author

**N83-24147#** Naval Submarine Medical Research Lab., Groton, Conn. Physiology Dept.
**PROLONGED LOW-LEVEL CO2 EXPOSURE AND ITS EFFECT ON KIDNEY CALCIFICATION** **c52**
Michael Shea *In* Undersea Medical Society, Inc. Effect of CO2 on Mammalian Organisms Dec. 1982 5 p ref (For primary document see N83-24139 13-51)
Avail: NTIS HC A06/MF A01

Studies of guinea pigs exposed for prolonged periods to 1% CO2 showed two important findings: increased kidney calcification as measured in kidney calcium content, and ultrastructural changes of the lungs involving a proliferation of pneumocyte II cells, considered to be precursors of alveolar lining cells (Type I) and the site of surfactant production. Author

**N83-24148#** National Cancer Cytology Center, Melville, N.Y.
**CO2 HOMEOSTASIS AND CARCINOGENESIS: MAMMALIAN RESPONSE TO AN INCREASINGLY HOSTILE ENVIRONMENT** **c52**
A. E. Goldsmith and G. F. Ryan (Brookhaven Hospital, Patchogue, N.Y.) *In* Undersea Medical Society, Inc. Effect of CO2 on Mammalian Organisms Dec. 1982 14 p refs (For primary document see N83-24139 13-51)
Avail: NTIS HC A06/MF A01

Bone is the body's major reservoir of CO2. It is not unexpected that a bone lesion, Paget's disease, provided our first clue to the possible involvement of chronically elevated CO2 tensions in the pathogenesis of certain diseases. Chronic exposure to CO2 increases bone CO2, calcium, an phosphorus. X-ray diffraction analysis detected in the osteitic bone mineral a complex carbonate rich phosphate that occurs naturally in rock and is able to accommodate relatively large amounts of CO2 as carbonate. The physicochemical properties of this substance, including its ready solubility in citrates, might explain the clinical radiographic observations seen in Paget's disease. The presence of this carbonate rich phosphate in osteitic bone mineral and the association of Paget's disease with malignancy have prompted us to consider the carcinogenic effects of elevated CO2 concentrations on mammalian tissue. Author

**N83-24149#** Florida State Univ., Tallahassee.
**RADIATION-INDUCED EFFECTS IN ORGANIC SYSTEMS Final Report**
Russell H. Johnsen 30 Sep. 1982 11 p refs
(Contracts DE-AS05-76ER-02001; EY-76-5-05-2001)
(DE83-005056; DOE/ER-02001/T1) Avail: NTIS HC A02/MF A01

Processes involved in the absorption and distribution of high-energy radiation in organic molecules are discussed. The gross chemical effects of radiation in a number of important classes of organic compounds including alcohols, aliphatic acids, aliphatic hydrocarbons, and aromatic hydrocarbons were studied. Basic information was acquired that has led to a better understanding of the effects of high-energy radiation on condensed media. The so-called protective effect of low concentrations of aromatic hydrocarbons was also studied. A contribution of lasting significance was the development of a technique for the post-radiolysis analysis of trapped free radicals by photochemical means. Charge-exchange processes, ionization efficiencies (w-values), radical decay process in solids and ion-dissociation reactions were studied; the first by means of a modified time-of-flight mass spectrometer, the second utilizing an ionization chamber, the third using electron spin resonance detection, and the last involving the use of a dual mass spectrometer. DOE

**N83-24150#** Vanderbilt Univ., Nashville, Tenn. Dept. of Radiology.
**BIOMEDICAL COMPUTING TECHNOLOGY INFORMATION CENTER (BCTIC) Progress Report, 1 Dec. 1981 - 30 Nov. 1982**
30 Jul. 1982 37 p refs
(Contract DE-AS05-80EV-10343)
(DE82-020926; DOE/EV-10343/32) Avail: NTIS HC A03/MF A01

Details of the operation of a biomedical computing information center are given. Several computer programs are described. Computer programs on chromatography, statistical analysis, and hormone-receptor binding are among those discussed. DOE

**N83-24151#** Moshman Associates, Inc., Bethesda, Md.
**ALTERNATIVE STRATEGIES FOR DEVELOPING RELIABLE ESTIMATES OF NATIONAL ACADEMIC BASIC RESEARCH EXPENDITURES BY FIELD OF SCIENCE AND ENGINEERING Final Report, 1981 - 1982**
David E. Trevett and Jack Moshman Jun. 1982 40 p
(Grant NSF SRS-81-14521)
(PB83-132779) Avail: NTIS HC A03/MF A01 CSCL 05A

The contractor researched and evaluated alternative approaches for gathering data with sufficient reliability to generate estimates of basic research expenditures, at disaggregated science and engineering levels from the 500 to 600 academic R and D performers. A wide range of contacts were made to evoke and discuss all suggestions and comments. The study recommended using existing university computerized recordkeeping systems and that by informing institutions sufficiently in advance of needed information, the basic research expenditures query could be made

a part of the annual NSF Survey of Scientific and Engineering Expenditures at Universities and Colleges. GRA

**N83-24152#** Joint Publications Research Service, Arlington, Va.
**USSR REPORT: LIFE SCIENCES. BIOMEDICAL AND BEHAVIORAL SCIENCES, NO. 31**
13 Apr. 1983 112 p refs Transl. into ENGLISH from various Russian articles
(JPRS-83247) Avail: NTIS HC A06

Several areas of biomedical and behavioral sciences were addressed, including agrotechnology, biochemistry, genetic engineering, laser effects, physiology, and public health. For individual titles, see N83-24153 through N83-24156.

**N83-24153#** Joint Publications Research Service, Arlington, Va.
**PROSPECTS OF USING STIMULATING LASER THERAPY IN OPHTHALMOLOGY** **c52**
L. A. Linnik, N. I. Usov, P. P. Chechin, and O. S. Pelepchuk *In* JPRS USSR Rept.: Life Sci. Biomed. and Behavioral Sci., No. 31 (JPRS-8324) 13 Apr. 1983 p 24-31 refs Transl. into ENGLISH from Oftalmologicheskiy Zh. (Odessa), no. 4, 1982 p 193-197 (For primary document see N83-24152 13-51)
Avail: NTIS HC A06

The clinical use of lasers in ophthalmology has a relatively short history, numbering about two decades. The first research is referable to the mid 1960's. The possibility of using lasers in ophthalomology was studied, the specifications for their design refined and the main parameters of radiation defined. As a result of extensive research and designing work by ophthalmologists in collaboration with competent technical enterprises, domestic laser instruments were developed for use in ophthalmology, and indications were elaborated for use of laser radiation in the treatment of a number of eye diseases, and this provided the conditions for clinical use of lasers. Author

**N83-24154#** Joint Publications Research Service, Arlington, Va.
**SO-CALLED LASER STIMULATION OF MACULA LUTEA, AND POSSIBLE THEORETICAL INTERPRETATION OF MECHANISM OF ITS EFFECT** **c52**
M. M. Krasnov, A. V. Bolshunov, G. G. Ziangirova, and N. N. Pivovarov *In* JPRS USSR Rept.: Life Sci. Biomed. and Behavioral Sci., No. 31 (JPRS-8324) 13 Apr. 1983 p 32-37 refs Transl. into ENGLISH from Oftalmologicheskiy Zh. (Odessa), no. 4, 1982 p 197-201 (For primary document see N83-24152 13-51)
Avail: NTIS HC A06

In recent years, several reports have appeared in the Soviet literature use of lasers for photostimulation of the macula in the presence of dysbinocular amblyopia and maculodystrophy. The positive therapeutic response consisted mainly of more less stable improvement of visual acuity. Various laser sources (argon, helium-neon, rudy, neodymium), methods and modes of delivery were used for laser stimulation treatment. Efforts have also been made to explain the mechanism of the stimulating effect of laser radiation. Author

**N83-24155#** Joint Publications Research Service, Arlington, Va.
**STIMULATING EFFECT OF HELIUM-NEON LASERS ON ACUTE INFLAMMATORY PROCESSES IN THE EYE** **c52**
G. S. Semenova, I. I. Vorobyeva, V. P. Semenov, and T. P. Donarskaya *In* JPRS USSR Rept.: Life Sci. Biomed. and Behavioral Sci., No. 31 (JPRS-8324) 13 Apr. 1983 p 38-42 refs Transl. into ENGLISH from Oftalmologicheskiy Zh. (Odessa), no. 4, 1982 p 201-204 Previously announced as A83-13603 (For primary document see N83-24152 13-51)
Avail: NTIS HC A06

The mechanism of effect of lasers is based on absorption of luminous energy by atoms and molecules of compounds, with transformation into thermal, acoustic and mechanical energy of photochemical processes. This infuences biophysical and biochemical processes in tissues, and has a positive effect on functional state of the nervous, vascular and skeletomuscular systems of man. The interest in use in medicine of gas (helium-neon, argon) lasers, which are characterized by monochromatic and coherent radiation, is related to the absence of a marked thermal effect and presence of distinct stimulating effect on biological objects. Author

**N83-24156#** Joint Publications Research Service, Arlington, Va.
**STIMULATING LASER THERAPY FOR CORNEAL DISEASES USING RUBY LASERS** **c52**
Ye. S. Libman, Yu. I. Kiyko, and S. V. Ivanov *In* JPRS USSR Rept.: Life Sci. Biomed. and Behavioral Sci., No. 31 (JPRS-8324) 13 Apr. 1983 p 43-47 refs Transl. into ENGLISH from Oftalmologicheskiy Zh. (Odessa), no. 4, 1982 p 204-207 (For primary document see N83-24152 13-51)
Avail: NTIS HC A06

In recent years, the attention of scientists was specially drawn to the effects of low power laser radiation on various biological processes. Experimental and clinical studies offer convincing evidence of the fact that low tensity monochromatic laser radiation has stimulating properties, which can help normalize certain pathological states. Lasers generating in the red part of the spectrum, in particular helium-neon lasers, have the highest stimulating activity; low-powered helium-neon laser radiation is used in the treatment of trophic ulcers and wounds that do not heal for a long time. Author

**N83-23835#** National Research Council of Canada, Ottawa (Ontario).
**THE PROSPECTS FOR THE APPLIED GENETIC ENGINEERING OF YEAST**
Harry vanKeulen and David Y. Thomas *In* Midwest Research Inst. Biotechnol. for the Production of Chem. and Fuels from Biomass Dec. 1982 p 17-30 refs (For primary document see N83-23833 13-44)
Avail: NTIS HC A09/MF A01

# 52 AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and weightlessness.

**N83-24157*** National Aeronautics and Space Administration, Washington, D. C.
**AEROSPACE MEDICINE AND BIOLOGY. A CONTINUING BIBLIOGRAPHY WITH INDEXES**
Apr. 1983 79 p
(NASA-SP-7011(244); NAS 1.21:7011(244)) Avail: NTIS HC $7.00 CSCL 06E

This bibliography lists 286 reports, articles and other documents introduced into the NASA scientific and technical information system in March 1983. Author

**N83-24158*#** Rockefeller Univ., New York.
**VESTIBULAR-INDUCED VOMITING AFTER VESTIBULOCEREBELLAR LESIONS**
Alan D. Miller and Victor J. Wilson [1982] 10 p refs
(Grants NAG-2164; NsG-2380; NIH-NS-02619)
(NASA-CR-170276; NAS 1.26:170276) Avail: NTIS HC A02/MF A01 CSCL 06E

Vestibular stimulation, by sinusoidal electrical polarization of the labyrinths of decerebrate cats which can produce vomiting and related activity which resembles motion sickness was examined. The symptoms include panting, salivation, swallowing, and retching as well as vomiting. These symptoms can be produced in cats with lesions of the posterior cerebellar vermis. It is suggested that a transcerebellar pathway from the vestibular apparatus through the nodulus and uvula to the vomiting center is not essential for vestibular induced vomiting and the occurrence of many symptoms of motion. E.A.K.

**N83-24159*#** Rockefeller Univ., New York.
**VOMITING CENTER REANALYZED: AN ELECTRICAL STIMULATION STUDY**
Alan D. Miller and Victor J. Wilson [1982] 15 p refs

(Grants NAG-2164; NsG-2380; NIH-NS-02619)
(NASA-CR-170272; NAS 1.26:170272) Avail: NTIS HC A02/MF A01

Electrical stimulation of the brainstem of 15 decerebrate cats produced stimulus-bound vomiting in only 4 animals. Vomiting was reproducible in only one cat. Effective stimulating sites were located in the solitary tract and reticular formation. Restricted localization of a vomiting center, stimulation of which evoked readily reproducible results, could not be obtained. Author

**N83-24160*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

**BED-REST STUDIES: FLUID AND ELECTROLYTE RESPONSES**

John E. Greenleaf Apr. 1983 17 p refs Presented at the Space Physiol. Conf., Toulouse, 1-4 Mar. 1983
(NASA-TM-84357; A-9299; NAS 1.15:84357) Avail: NTIS HC A02/MF A01 CSCL 06P

Confinement in the horizontal position for 2 to 3 weeks results in a chronic decrease in plasma volume, increased interstitial fluid volume, and unchanged or slightly increased extracellular fluid volume. Concentrations of blood electrolytes, glucose, and nitrogenous constituents remain within normal limits of variability when maintenance levels of isometric or isotonic exercise are performed for 1 hr/day. Hematocrit and plasma osmolality can be elevated significantly throughout bed rest (BR). Significant diuresis occurs on the first day, and increases in urine Na and Ca continue throughout BR, although voluntary fluid intake is unchanged. Urine Na and K are evaluated during the second week of BR in spite of stabilization of PV and extracellular volume. The initial diuresis probably arises from the extracellular fluid while subsequent urine loss above control levels must come from the intracellular fluid. Preservation of the extracellular volume takes precedance over maintenance of the intracellular fluid volume. The functioning of a natriuretic factor (hormone) to account for the continued increased loss of Na in the urine is suggested. A.R.H.

**N83-24161#** Centro Informazioni Studi Esperienze, Milan (Italy). Documentation Service.

**A REAL-TIME DISTRIBUTED MULTIMICRO SYSTEM FOR NEUROPHYSIOLOGICAL INVESTIGATIONS**

M. Borghesi and M. Pissarello (Polytechnic of Milan) 1982 11 p refs Presented at Real-Time Systems Symp., Los Angeles, 7-9 Dec. 1982 Sponsored by CNR, Politechnic of Milan, and Milan Univ.
(CISE-1865) Avail: NTIS HC A02/MF A01

A real time Distributed Multimicro System specifically designed and implemented to study pathologic conditions of the ear is discussed. Based on the identified control algorithm, the set of operations to be executed was defined. High computational burden involved by operations calls for a processing element with a high throughput rate. Functional features, processing element, interelement links, and the real time operating system are discussed. Author

**N83-24162#** Research Inst. of National Defence, Umea (Sweden).

**ORAL INTAKE OF RADIONUCLIDES IN THE POPULATION. A REVIEW OF BIOLOGICAL FACTORS OF RELEVANCE FOR ASSESSMENT OF ABSORBED DOSE AT LONG TERM WASTE STORAGE**

Lennart Johansson Nov. 1982 62 p refs Sponsored by Swedish Nuclear Fuel Supply Company
(FOA-C-40161-W4) Avail: NTIS HC A04/MF A01

Dose factors of some radionuclides were reviewed with respect to a chronic oral intake by members of the public. The radionuclides taken into account are Pu(239), Np(237), Ra(226), Th(230), Pa(231), Tc(99), and I(129) all of which might be of potential hazard at a long term storage disposal. The parameter that has the major influence on the dose factor, for most of the radionuclides studied, is the uptake from the gut. In order to assess the dose factor it is therefore essential to make a good estimate of the gastrointestinal uptake of the radionuclides under the actual conditions. The annual limit of intake (ALI) given in ICRP 30, is intended to be applicable on a population of workers, and for a single intake. Since the gut uptake figures in the ICRP-publication are based mainly on uptake values received in experimental animals, given single relatively large oral doses of the isotope studied. From a view of current literature, gut absorbation factors and dose factors, for use for members of the public at a chronic oral intake, are suggested. Author

**N83-24163#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**ZONOGRAPHIC DIAGNOSIS OF DISEASES OF THE INTERVETEBRAL DISK IN THE LIGHT OF OUR OWN EXPERIMENTS**

Stanislaw Bryc and Janusz Zlomaniec 6 Jan. 1983 14 p refs Transl. into ENGLISH from Ann. Univ. M. Curie-Sklodowska (Poland), v. 34, no. 17, 1979 p 123-132
(AD-A123992; FTD-ID(RS)T-1373-82) Avail: NTIS HC A02/MF A01 CSCL 06/5

The correctness of diagnosis and accurate definition of pathological changes established by planigraphic examination and zonography are examined. Results obtained by the new diagnostic method are reported. E.A.K.

**N83-24164#** Army Research Inst. of Environmental Medicine, Natick, Mass.

**PHYSIOLOGICAL FACTORS AFFECTING UPPER BODY AEROBIC EXERCISE**

Michael N. Sawka, Michael E. Foley, Nancy A. Pimental, and Kent B. Pandolf 23 Aug. 1982 21 p refs
(AD-A121511; USARIEM-M39/82) Avail: NTIS HC A02/MF A01 CSCL 06/19

This study examined the influence selected physiological measurements have upon peak oxygen uptake (peak VO2) elicited by upper body (arm crank) exercise employing crank rates of 30 and 70 rpm. Nine male volunteers completed: two maximal effort arm crank tests, one cycle exercise maximal aerobic power (AP) test, measurements of isokinetic elbow extension strength (ES), isometric grip strength (GS), and arm volume (AV). Partial correlation coefficients (R) were obtained from a multiple regression analysis. For the 30 rpm protocol, peak VO2 was strongly related to AP ($r = 0.80$; $R = 0.51$) and moderately related to ES ($R = -0.41$; $R = -0.41$) and GS ($R = 0.40$; $R = 0.30$). For the 70 rpm protocol, peak VO2 was found to be strongly related to AP ($R = 0.94$; $R = 0.88$). AV values were not found to have a marked influence on upper body peak VO2 at either crank rate. These data indicate that aerobic power for cycle exercise is the most important determinant of upper body aerobic exercise performance. Author (GRA)

**N83-24165#** Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario).

**THE MAXIMAL EXERCISE TREADMILL STRESS TEST, CURRENT USES AND LIMITATIONS IN CORONARY ARTERY DISEASE**

W. F. Lewis Sep. 1982 19 p refs Presented at the CFMS Clinical Conf., Berchtesgaden (West Germany), 1-3 Jun. 1982
(AD-A121748; DCIEM-82-R-47) Avail: NTIS HC A02/MF A01 CSCL 06/5

Considerable controversy surrounds the clinical value of exercise stress testing, particularly in the diagnosis of coronary artery disease (CAD). For example, ECG ST segment depression during exercise (the classic criterion for a positive test) may have only limited diagnostic worth in a population with low disease prevalence. Conversely, a negative test result may have questionable value in a population with high disease prevalence. On the other hand, ST segment measurement represents only one important observation that can be made during the test procedure: increased predictive accuracy for CAD may result if additional clinical patient responses (e.g., blood pressure) are considered along with ECG interpretation. A review of recent literature indicates that a critical evaluation of the clinical importance of exercise stress testing continues. This paper presents current applications

and limitations of exercise stress testing in CAD, and examines the predictive accuracy of this diagnostic approach. Author (GRA)

**N83-24166#** School of Aerospace Medicine, Brooks AFB, Tex. Radiation Sciences Div.
**KIEL, JOHNATHAN L. Final Report, Jan. - Jun. 1982**
Oct. 1982 21 p refs
(AF Proj. 7757)
(AD-A121792; SAM-TR-82-38) Avail: NTIS HC A02/MF A01 CSCL 06/5

This report provides an overview of the medical applications of radiofrequency radiation (RFR) hyperthermia. RFR has limitations in focusing and penetration but can heat tissue selectively, on the basis of water content and dielectric properties. nonionizing electromagnetic radiation may operate through several mechanisms, which are determined by the amount of energy deposited in tissues and the type of tissue irradiated. These attributes imply great versatility in the clinical applications of RFR. Furthermore, the synergistic activity of RFR with ionizing radiation and chemotherapy in cancer treatment increases their effectiveness at lower doses. Lowered toxicity is a direct consequence of a lower effective dose in the presence of RFR. With improved therapeutic instrumentation and dosimetry and a better understanding of bioeffect mechanisms, the number of medical applications and the effectiveness fof RFR should continue to increase.
Author (GRA)

**N83-24167#** New York State Dept. of Health, Albany.
**BIOCHEMICAL CHANGES IN BLOOD COMPONENTS AFTER LETHAL DOSES OF RADIATION Final Report, Oct. 1980 - Sep. 1981**
Albert M. Magro Oct. 1982 28 p refs
(Contract F33615-78-D-0617; AF Proj. 7757)
(AD-A121815; SAM-TR-82-27) Avail: NTIS HC A03/MF A01 CSCL 06/18

Nonpeptide, peptide, and protein blood components were measured postirradiation in Wistar rats to investigate biochemical changes that might be related to or form the basis of radiation-induced emesis. The rats were irradiated with lethal doses of radiation, and blood components were analyzed at various times postirradiation. The blood-component levels were compared to those of nonirradiated controls to determine if any significant changes occurred due to the radiation. GRA

**N83-24168#** School of Aerospace Medicine, Brooks AFB, Tex. Crew Performance Branch.
**FATIGUE, WORKLOAD, AND PERSONALITY INDICES OF AIR TRAFFIC CONTROLLER STRESS DURING AN AIRCRAFT SURGE RECOVERY EXERCISES Final Report, Apr. - Dec. 1981**
Stephen M. Rokicki Oct. 1982 15 p refs
(AF Proj. 2729)
(AD-A121908; SAM-TR-82-31) Avail: NTIS HC A02/MF A01 CSCL 06/19

During an aircraft surge recovery exercise, stress survey instruments were administered to 25 USAF air traffic controllers. The survey instruments consisted of sleep reports, fatigue and workload scores, and the State-Trait Personality Inventory (STPI). The STPI yields scores to measure anxiety, curiosity, and anger. Data were collected for a 4-day period during the exercise, with a maximum of 22 controllers participating on any single day. The data were collected to provide a baseline for comparison with future studies involving chemical warfare defense equipment. Although the controllers averaged more than 7 hours sleep per night during the exercise period, 70% felt they could have used more sleep. The average subjective fatigue level never suggested more than moderate fatigue. The average perceived workload corresponded to a challenging but manageable level. Average State scores for anxiety, curiosity, and anger were generally low; average Trait scores for these same emotions were below scores reported for Navy recruits and college freshmen. During the course of the exercise, significant differences were found in State anxiety scores, as the novel situation (the exercise) became a familiar routine. The major conclusion is that the surge recovery exercise, in comparison to normal duty conditions, had minimal effect on all measures for this group of controllers. Author (GRA)

**N83-24169#** Aeronautical Research Labs., Melbourne (Australia).
**INVESTIGATION OF DISCREPANCIES IN MEASUREMENTS MADE WITH A MINILAB WBGT INDEX METER**
A. Ross Sep. 1982 27 p
(AD-A122972; ARL/SYS-TM-64; AR-002-908) Avail: NTIS HC A03/MF A01 CSCL 14/2

Measurements of wet bulb, dry bulb, globe temperatures and WBGT Index made with a particular 'MINILAB' were found to be mutually inconsistent. An investigation into the source of the discrepancies showed that they were largely methodological and attributable to the instrument. Individual measurements of wet, dry and globe temperatures were found to be reliable. GRA

**N83-24170#** National Academy of Sciences - National Research Council, Arlington, Va. Ad Hoc Committee on Polar Biomedical Research.
**POLAR BIOMEDICAL RESEARCH: AN ASSESSMENT Technical Report, 15 Dec. 1980 - 30 Sep. 1982**
Sep. 1982 94 p refs
(Contract DAMD17-81-C-1012)
(PB83-119081) Avail: NTIS HC A05/MF A01 CSCL 06S

A committee of physicians, social scientists, and biologists reviews polar biomedical research, identifies research needs, and recommends priorities. Main conclusions are that psychocultural, compared with purely biological, factors will continue to generate a disproportionately large share of polar medical problems, that improving awareness and application of the biomedical data that exist in private and government data banks is a top priority, and that greater emphasis on polar biomedicine in educational curricula and professional society activities is urgent. GRA

**N83-24171#** National Academy of Sciences - National Research Council, Arlington, Va. Ad Hoc Committee on Polar Biomedical Research.
**POLAR BIOMEDICAL RESEARCH: AN ASSESSMENT. APPENDIX: POLAR MEDICINE, A LITERATURE REVIEW Technical Report, 1940 - 1981**
Frederick C. Koerner 1982 95 p
(Contract DAMD17-81-C-1012)
(PB83-119099) Avail: NTIS HC A05/MF A01 CSCL 06S

A bibliography of 729 documents on polar biomedical research covering the period 1940-1981 is presented and briefly reviewed under the headings: Nutrition, Physiologic Changes during Polar Life, and Pathologic Changes during Polar Life. GRA

**N83-24143#** Pennsylvania Univ., Philadelphia. Medical Center.
**TOLERANCE AND ADAPTATION TO ACUTE AND CHRONIC HYPERCAPNIA IN MAN**
James M. Clark *In* Undersea Medical Society, Inc. Effect of CO2 on Mammalian Organisms Dec. 1982 13 p refs (For primary document see N83-24139 13-51)
Avail: NTIS HC A06/MF A01

**N83-24144#** Wisconsin Univ., Milwaukee. Dept. of Physiology.
**SOME PHYSIOLOGIC CHANGES DURING INHALATION OF 1%-6% CO2 IN MAN AND PONY**
Hubert Forster *In* Undersea Medical Society, Inc. Effect of CO2 on Mammalian Organisms Dec. 1982 10 p refs (For primary document see N83-24139 13-51)
Avail: NTIS HC A06/MF A01

**N83-24145#** Lovelace Foundation for Medical Education and Research, Albuquerque, N. Mex. Dept. of Physiology.
**COMMENTS ON PERMISSIBLE CO2 CONCENTRATIONS IN HUMAN SPACE FLIGHT**
Ulrich C. Luft *In* Undersea Medical Society, Inc. Effect of CO2 on Mammalian Organisms Dec. 1982 10 p refs (For primary document see N83-24139 13-51)
Avail: NTIS HC A06/MF A01

**N83-24146#** Schaefer (Karl E.), Old Lyme, Conn.
**EFFECT OF CHRONIC EXPOSURE TO LOW CO2 CONCENTRATIONS ON RESPIRATION, ACID-BASE BALANCE, AND TARGET ORGANS**
Karl E. Schaefer *In* Undersea Medical Society, Inc. Effect of CO2 on Mammalian Organisms Dec. 1982 14 p refs (For primary document see N83-24139 13-51)
Avail: NTIS HC A06/MF A01

**N83-24147#** Naval Submarine Medical Research Lab., Groton, Conn. Physiology Dept.
**PROLONGED LOW-LEVEL CO2 EXPOSURE AND ITS EFFECT ON KIDNEY CALCIFICATION**
Michael Shea *In* Undersea Medical Society, Inc. Effect of CO2 on Mammalian Organisms Dec. 1982 5 p ref (For primary document see N83-24139 13-51)
Avail: NTIS HC A06/MF A01

**N83-24148#** National Cancer Cytology Center, Melville, N.Y.
**CO2 HOMEOSTASIS AND CARCINOGENESIS: MAMMALIAN RESPONSE TO AN INCREASINGLY HOSTILE ENVIRONMENT**
A. E. Goldsmith and G. F. Ryan (Brookhaven Hospital, Patchogue, N.Y.) *In* Undersea Medical Society, Inc. Effect of CO2 on Mammalian Organisms Dec. 1982 14 p refs (For primary document see N83-24139 13-51)
Avail: NTIS HC A06/MF A01

**N83-24153#** Joint Publications Research Service, Arlington, Va.
**PROSPECTS OF USING STIMULATING LASER THERAPY IN OPHTHALMOLOGY**
L. A. Linnik, N. I. Usov, P. P. Chechin, and O. S. Pelepchuk *In* JPRS USSR Rept.: Life Sci. Biomed. and Behavioral Sci., No. 31 (JPRS-8324) 13 Apr. 1983 p 24-31 refs Transl. into ENGLISH from Oftalmologicheskiy Zh. (Odessa), no. 4, 1982 p 193-197 (For primary document see N83-24152 13-51)
Avail: NTIS HC A06

**N83-24154#** Joint Publications Research Service, Arlington, Va.
**SO-CALLED LASER STIMULATION OF MACULA LUTEA, AND POSSIBLE THEORETICAL INTERPRETATION OF MECHANISM OF ITS EFFECT**
M. M. Krasnov, A. V. Bolshunov, G. G. Ziangirova, and N. N. Pivovarov *In* JPRS USSR Rept.: Life Sci. Biomed. and Behavioral Sci., No. 31 (JPRS-8324) 13 Apr. 1983 p 32-37 refs Transl. into ENGLISH from Oftalmologicheskiy Zh. (Odessa), no. 4, 1982 p 197-201 (For primary document see N83-24152 13-51)
Avail: NTIS HC A06

**N83-24155#** Joint Publications Research Service, Arlington, Va.
**STIMULATING EFFECT OF HELIUM-NEON LASERS ON ACUTE INFLAMMATORY PROCESSES IN THE EYE**
G. S. Semenova, I. I. Vorobyeva, V. P. Semenov, and T. P. Donarskaya *In* JPRS USSR Rept.: Life Sci. Biomed. and Behavioral Sci., No. 31 (JPRS-8324) 13 Apr. 1983 p 38-42 refs Transl. into ENGLISH from Oftalmologicheskiy Zh. (Odessa), no. 4, 1982 p 201-204 Previously announced as A83-13603 (For primary document see N83-24152 13-51)
Avail: NTIS HC A06

**N83-24156#** Joint Publications Research Service, Arlington, Va.
**STIMULATING LASER THERAPY FOR CORNEAL DISEASES USING RUBY LASERS**
Ye. S. Libman, Yu. I. Kiyko, and S. V. Ivanov *In* JPRS USSR Rept.: Life Sci. Biomed. and Behavioral Sci., No. 31 (JPRS-8324) 13 Apr. 1983 p 43-47 refs Transl. into ENGLISH from Oftalmologicheskiy Zh. (Odessa), no. 4, 1982 p 204-207 (For primary document see N83-24152 13-51)
Avail: NTIS HC A06

# 53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

**N83-24172** Royal Aircraft Establishment, Farnborough (England).
**THE OPTICAL DETECTION OF AIR TARGETS AND ITS DEPENDENCE ON ENVIRONMENTAL, TARGET AND OBSERVATIONAL PARAMETERS FOR GROUND-TO-AIR AND AIR-TO-AIR OBSERVATIONS**
H-E. Hoffmann Sep. 1982 28 p refs Transl. into ENGLISH of "Die optische efassung von luftzielen in abhaengigkeit von umgebungs-, ziel, und beobachtungsparametern bei beobachtungen boden-luft BZW. luft-luft" rept. BMVg-FBWT-81-12, West Germany
(RAE-Trans-2097; BR87704) Copyright. Avail: Issuing Activity

A series of outdoor tests on the visibility of aircraft was undertaken in co-operation with the Bundeswehr. The main purpose of the program was to determine the effects of various environmental, target and observation parameters on their maximum detection and recognition ranges. The environmental parameters considered were the degree of turbidity of the atmosphere, the background, direction of observation, aircraft height and brightness; the target parameters were their size and color and observations were made with the naked eye and binoculars. The standard target aircraft used during the tests was a DO27 painted dark green. Although the observations were made from the ground, the results can be used to give air-to-air observation range if required. Author

**N83-24173*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
**A LOOK AT MOTION IN THE FREQUENCY DOMAIN**
Andrew B. Watson and Albert J. Ahumada, Jr. Apr. 1983 13 p refs
(NASA-TM-84352; A-9304; NAS 1.15:84352) Avail: NTIS HC A02/MF A01 CSCL 05I

A moving image can be specified by a contrast distribution, c(x,y,t), over the dimensions of space x,y, and time t. Alternatively, it can be specified by the distribution C(u,v,w) over spatial frequency u,v and temporal frequency w. The frequency representation of a moving image is shown to have a characteristic form. This permits two useful observations. The first is that the apparent smoothness of time-sampled moving images (apparent motion) can be explained by the filtering action of the human visual system. This leads to the following formula for the required update rate for time-sampled displays. $W(c) = W(l) + ru(l)$ where w(c) is the required update rate in Hz, W(l) is the limit of human temporal resolution in Hz, r is the velocity of the moving image in degrees/sec, and u(l) is the limit of human spatial resolution in cycles/deg. The second observation is that it is possible to construct a linear sensor that responds to images moving in a particular direction. The sensor is derived and its properties are discussed. Author

**N83-24174*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
**DETECTION AND RECOGNITION OF SIMPLE SPATIAL FORMS**
Andrew B. Watson Apr. 1983 18 p refs
(NASA-TM-84353; A-9305; NAS 1.15:84353) Avail: NTIS HC A02/MF A01 CSCL 05I

A model of human visual sensitivity to spatial patterns is constructed. The model predicts the visibility and discriminability of arbitrary two-dimensional monochrome images. The image is analyzed by a large array of linear feature sensors, which differ in spatial frequency, phase, orientation, and position in the visual field. All sensors have one octave frequency bandwidths, and increase in size linearly with eccentricity. Sensor responses are processed by an ideal Bayesian classifier, subject to uncertainty. The performance of the model is compared to that of the human observer in detecting and discriminating some simple images. Author

**N83-24175#** National Aerospace Lab., Amsterdam (Netherlands). Flight Div.

**A MODEL OF THE HUMAN DECISION MAKER OBSERVING A DYNAMIC SYSTEM**

P. H. Wewerinke 31 Mar. 1981 65 p refs
(Contract NIVR-1857)
(NLR-TR-81062-U) Avail: NTIS HC A04/MF A01

A model of the human observer and decision maker is described. A submodel of the human observer is formulated in linear estimation theoretical terms including the perception of the displayed information of a linear process and the central information processing stage. The subsequent decision process is described in sequential decision theory by considering the hypothesis that an abnormal condition occurred by a generalized likelihood ratio test. On the basis of only two model parameters the model predicts the decision speed/accuracy trade off and various attentional characteristics. A variety of multivariable failure detection tasks was investigated. The predictive capability of the model is shown and in the specific effect of almost all task variables is accurately predicted by the model. E.A.K.

**N83-24176#** National Aerospace Lab., Amsterdam (Netherlands). Flight Div.

**AN EXPERIMENTAL ANALYSIS OF HUMAN MONITORING BEHAVIOR IN MULTIVARIABLE FAILURE DETECTION TASKS**

R. C. vandeGraaff 29 Jul. 1982 78 p refs
(Contract NIVR-1857)
(NLR-TR-81063-U) Avail: NTIS HC A05/MF A01

An experimental program which was designed to validate a model of the human observer and decision maker formulated in terms of linear estimation and classical sequential is discussed. The subjects had to detect and diagnose the occurrence of ramp failures which were superimposed upon zero mean stochastic Gaussian processes. The independent variables were signal handwidth, number of displays, correlation among displays, failure magnitude, failure type, and prior knowledge about failure type. The dependent variables were detection times, display deviations at the moments of response and false alarm rates. Heart rate, skin resistance and eye point of regard were measured. The display deviations which indicate a constant detection strategy are analyzed. In addition, the eye point of regard measurements rendered a useful insight into certain scanning characteristics. The physiological measures are sensitive only to the number of displays involved, and prior knowledge about failure type. E.A.K.

**N83-24177#** Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.

**PREDICTIVE MEASURES FOR THE ACHIEVEMENT OF TRAINING SUCCESS IN AIR FORCE TECHNICAL TRAINING M.S. Thesis**

Theodore M. Newstad and James A. Schuster Sep. 1982 72 p refs
(AD-A123005; AFIT-LSSR-37-82) Avail: NTIS HC A04/MF A01 CSCL 05/9

This research was conducted to investigate the predictive nature of a variety of measures for the achievement of training success at the Air Force Technical Training School, Chanute Air Force Base, Illinois. A sample of 1358 male and female airmen attending 12 technical training courses from 1 July 1981 to 15 February 1982 was analyzed using multiple regression analysis. Final course grade served as the criterion of training success. Predictor variables included four aptitude indices and one intelligence score from the Armed Services Vocational Aptitude Battery (ASVAB), seven biographical items, and four on-site instructional variables. Author (GRA)

**N83-24178#** Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.

**A MODEL AND FIELD TEST OF THE RELATIONSHIPS BETWEEN TASK CHARACTERISTICS, TASK ENVIRONMENT, INTRINSIC AND EXTRINSIC JOB SATISFACTION, JOB STRESS AND SELF-REPORTED JOB PERFORMANCE M.S. Thesis**

Norman E. Adams and Lathenia S. Harris Sep. 1982 98 p refs
(AD-A123006; AFIT-LSSR-90-82) Avail: NTIS HC A05/MF A01 CSCL 05/9

This thesis reviews the literature in the areas of job satisfaction, job stress, and self-rated job performance. Controversy has raged over the relationship between satisfaction and work outcomes - particularly job performance. This research attempts to develop a model of some of the more prominent variables that effect worker perceived productivity. The model hypothesizes that task characteristics effect intrinsic job satisfaction, task environment factors effect extrinsic job satisfaction, job satisfaction effects job stress, and job stress effects self-perceived productivity. Research data was collected at a large Department of Defense medical center, verified for reliability, and tested for correlation of the variables via the Pearson correlation and multiple regression statistical techniques. The research results indicated that all the model relationships were as hypothesized. Author (GRA)

# 54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

**N83-24179#** Mannesmann Demag Foerdertechnik, Wetter (West Germany).

**DEVELOPMENT AND TRIALS OF A CRANE CABIN IN THE FORM OF A MODERN, HUMAN WORKING POSITION Final Report, Dec. 1980**

Heinz Flaig Bonn Bundesministerium fuer Forschung und Technologie Nov. 1982 93 p refs In GERMAN, ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-HA-82-038; ISSN-0171-7618) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 19, 50

The physical conditions on a crane cabin which cause a high level of physical and mental stress which are incompatible with the crane operator's high degree of responsibility for men and materials are discussed. This results in a decrease in work interest and productivity and an increase the risk of accidents and damage to health. An ergonomically designed, modern standard crane cabin was developed. It is now possible to protect the operator from increased stress factors in his environment. Solving the problem of reducing vibration are emphasized. E.A.K.

**N83-24180#** Stuttgart Univ. (West Germany). Inst. fuer Steuerungstechnik der Werkzeugmaschinen und Fertigungseinrichtungen.

**ROBOT CONTROL WITH SENSORY FEEDBACK Final Report, Nov. 1980**

Gottfried Stute, Hans Erne, Kleinwaechter (Forschungs - und Entwicklungslabor KLERA, Loerrach, West Germany), and Karl-Heinz Droege (Forschungs - und Entwicklungslabor KERA, Loerrach, West Germany) Bonn Bundesministerium fuer Forschung und Technologie Nov. 1982 116 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-HA-82-040; ISSN-0171-7618) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 24,50

The development of a CP-robot control system with sensory feedback to automize an industrial machining task is discussed. The grinding of welding beads on car bodies by a five axis robot control system was developed to accomodate additional functions. Software modules for the processing of tactile sensor data are integrated into the control system. It is shown that the CP-control with sensory feedback is able to create motion programs which optimally fit a given workpiece surface that has to be machined. It is concluded that the developed control system increases the robots' adaptivity to curved surfaces and allows for quality control

during the work process. Minimal proramming is required because of algorithms for automatic pathe generation in the control. E.A.K.

**N83-24181#** Keller und Knappich, Augsburg (West Germany).
**DEVELOPMENT OF A SIX-AXES INDUSTRIAL ROBOT AND TESTING OF THE COMPLETE HANDLING SYSTEM Final Report, Mar. 1980**
Heinz Woern, Norbert Sedlmair, Hans-Richard Tradt, Gerard Duelen (Fraunhofer Inst. fuer Produktionsanlagen u. Konstruktionstech.), Claus-Peter Prager (Fraunhofer Inst. fuer Produktionsanlagen u. Konstruktionstech.), Thomas Seidl (Fraunhofer Inst. fuer Produktionsanlagen u. Konstruktionstech.), and Klaus Swaczina (Fraunhofer Inst. fuer Produktionsanlagen u. Konstruktionstech.) Bonn Bundesministerium fuer Forschung und Technologie Nov. 1982 106 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschund und Technologie
(BMFT-FB-HA-82-043; ISSN-0171-7618) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 22

A control unit which enables a continuous path control for 6-axes industrial robots of different designs was developed. The adaption of the control unit to the kinematics of a special industrial robot is planned by a suitable coordinate transformation, which is part of the software of the control unit. The control unit is technically flexible enough for use on the same robot of different sensors and drive systems. A high handling and functional safety, simplicity of handling by specific handling instructions and easy adaptability to other machines and installations connected with the robot during the operational sequence are emphasized. E.A.K.

**N83-24182#** Watkins and Associates, Lexington, Ky.
**A SECOND FIELD INVESTIGATION OF NOISE REDUCTION AFFORDED BY INSERT-TYPE HEARING PROTECTORS**
R. G. Edwards, A. B. Broderson, W. W. Green (Kentucky Univ. Medical Center), and B. L. Lempert (PHS) Apr. 1982 67 p refs (Contract PHS-NIOSH-210-81-3001)
(PB83-138768) Avail: NTIS HC A04/MF A01 CSCL 06Q

Field testing of noise reduction by earplugs was done. Ten factories and 280 employees took 1400 attenuation tests. User molded, expandable acoustic foam, custom molded, and acoustic wool types of earplugs were evaluated. Workers received protection ranging from about 9 decibels at 125 hertz to 29 decibels at 3150 hertz. Acoustic foam earplugs provided the best hearing protection, and acoustical wool, the least. It was concluded that actual noise protection depends on earplug design. GRA

# 55 PLANETARY BIOLOGY

Includes exobiology; and extraterrestrial life.

No abstracts in this category.

# 59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

No abstracts in this category.

# 60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering.*

**N83-24183*#** Michigan Univ., Ann Arbor. Dept. of Electrical and Computer Engineering.
**MODELS FOR EVALUATING THE PERFORMABILITY OF DEGRADABLE COMPUTING SYSTEMS**
Liang Tai Wu Jun. 1982 202 p refs
(Grant NsG-1306)
(NASA-CR-170228; NAS 1.26:170228; Rept-014524-20-T; SEL-169) Avail: NTIS HC A10/MF A01 CSCL 09B

Recent advances in multiprocessor technology established the need for unified methods to evaluate computing systems performance and reliability. In response to this modeling need, a general modeling framework that permits the modeling, analysis and evaluation of degradable computing systems is considered. Within this framework, several user oriented performance variables are identified and shown to be proper generalizations of the traditional notions of system performance and reliability. Furthermore, a time varying version of the model is developed to generalize the traditional fault tree reliability evaluation methods of phased missions. Author

**N83-24184*#** Michigan Univ., Ann Arbor. Dept. of Electrical and Computer Engineering.
**MODELS AND TECHNIQUES FOR EVALUATING THE EFFECTIVENESS OF AIRCRAFT COMPUTING SYSTEMS Final Report, 1 May 1976 - 30 Jun. 1982**
John F. Meyer Jul. 1982 25 p refs
(Grant NsG-1306)
(NASA-CR-170229; NAS 1.26:170229; Rept-014524-21-T; SEL-170) Avail: NTIS HC A02/MF A01 CSCL 09B

Models, measures, and techniques for evaluating the effectiveness of aircraft computing systems were developed. By 'effectiveness' in this context we mean the extent to which the user, i.e., a commercial air carrier, may expect to benefit from the computational tasks accomplished by a computing system in the environment of an advanced commercial aircraft. Thus, the concept of effectiveness involves aspects of system performance, reliability, and worth (value, benefit) which are appropriately integrated in the process of evaluating system effectiveness. Specifically, the primary objectives are: the development of system models that provide a basis for the formulation and evaluation of aircraft computer system effectiveness, the formulation of quantitative measures of system effectiveness, and the development of analytic and simulation techniques for evaluating the effectiveness of a proposed or existing aircraft computer. Author

**N83-24185#** Dornier-Werke G.m.b.H., Oberpfaffenhofen (West Germany). Bereich Elektronik.
**ASSEMBLY FOR ONBOARD SAR DATA PROCESSING. PHASE 1: EXPERIMENTAL PRETESTING AT AN AD-CONVERTER, TIME EXPANSION AND AZIMUT MEMORY Final Report, Apr. 1981**
Roland Schotter, Herbert Hoelzl, Herbert Busch, Juergen Koyro, and Axel Wiegmann Bonn Bundesministerium fuer Forschung und Technologie Dec. 1982 101 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-82-025; ISSN-0170-1339) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 21

The functional modules AD-conversion, time expansion, and corner turn memory were investigated. Among the fast 6 bit integrated AD converters appearing on the market the TRW type TDC 1014 J and the SIEMENS SDA 5010 were selected for the measurements. A breadboard of the SDA 5010 was built. The time expansion was designed according to the double buffer

principle. The memory was built up with CMOS technology. The power consumption of the time expansion could be limited to 12,2 Watt. The investigations of the corner turn memory clearly showed up the need for a carefully designed control electronics. The memory matrix (9 MByste) was designed with dynamic NMOS circuits. The complete control electronics could be designed with low power Schottky TTL. The power consumption was calculated to be 121 Watts. S.L.

**N83-24186#** Massachusetts Univ., Amherst.
**CONSTRUCTION AND EVALUATION OF CONTENT ADDRESSABLE MEMORIES Final Report, 1 Jan. 1979 - 30 Jun. 1982**
Caxton C. Foster Jun. 1982 35 p ref
(Grant DAAG29-79-G-0046)
(AD-A123028; ARO-16088.8-EL) Avail: NTIS HC A03/MF A01 CSCL 09/1

The work on this grant has fallen into four distinct phases. First of all, we constructed a small (320-word) Content Addressable Memory (CAM) from commercially available components. Second, we selected a number of problems intended to span the spectrum of CAM applications and programmed these on our small machine. Third, we analyzed the strengths and weaknesses of our small machine as displayed in the solution of these problems. Finally, we designed, but have not yet constructed, a full-scale CAM that retained the strengths of our small machine and incorporated features intended to overcome its weaknesses. In parallel with the above work, in an attempt to aid in the selection of representative problems for study, we have spent a considerable amount of effort investigating the theoretical capabilities of CAMs.
Author (GRA)

**N83-24187#** Los Alamos Scientific Lab., N. Mex.
**CONFIGURATING A SUPERCOMPUTER FOR AN INTERACTIVE SCIENTIFIC WORKLOAD**
Wayne Anderson, Richard Brice, and William Alexander 1982 10 p Presented at the 13th Computer Measurement Group Conf., San Diego, Calif., 14 Dec. 1982
(Contract W-7405-eng-36)
(DE82-018367; LA-UR-82-1572; CONF-82102-1) Avail: NTIS HC A02/MF A01

A detailed, validated simulation model of an existing Cray-1 running under an interactive operating system was used to investigate configurations of a new supercomputer. The goal was to determine the optimum configuration for a known interactive scientific workload. Questions considered included how much main memory would be needed and whether to acquire an optional fast swapping device. DOE

**N83-24188#** Federal Compiler Testing Center, Falls Church, Va. Federal Software Testing Center.
**PERKIN-ELMER, PERKIN-ELMER SYSTEM 3240, FORTRAN VII R05**
5 Aug. 1982 12 p
(PB83-128892; OSD/FSTC-82/120) Avail: NTIS HC A02/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the PERKIN-ELMER FORTRAN VII R05 (Versions 7D, 7O, 7Z) running under the OS/32 R06-02 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 FORTRAN Standard (X3-9.1978/FIPS PUB 69). The compiler was validated against the Full Language FORTRAN level of FIPS PUB 69. The VSR is made up of several sections showing all the discrepancies found-if any. These include an overview of the validation which lists all categories of discrepancies within X3.9-1978, and a detailed listing of discrepancies together with the tests which failed. GRA

**N83-24189#** Federal Compiler Testing Center, Falls Church, Va. Federal Software Testing Center.
**CRAY RESEARCH, INC. CRAY 1S/1400, CRAY FORTRAN TRANSLATOR (CFT) VERSION 1.10**
15 Jun. 1982 16 p
(PB83-128900; OSD/FSTC-82/180) Avail: NTIS HC A02/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Cray Research, Inc., CRAY FORTRAN Translator (CFT) Version 1.10 running under the CRAY Operating System (COS) Version 1.11 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 FORTRAN Standard (X3.9-1978/FIPS PUB 69). The compiler was validated against the Full Language Fortran level of FIPS PUB 69. The VSR is made up of several sections showing al the discrepancies found -if any. These include an overview of the validation which lists all categories of discrepancies within X3.9-1978, and a detailed listing of discrepancies together with the tests which failed. GRA

**N83-24190#** Siemens A.G., Munich (West Germany). Unternehmensbereich Bauelemente.
**MICROCOMPUTER-LSI-CHIPS Final Report**
Guenter Sander, Bernd Huber, Irmfried Bromme, Heinrich Kessler, Hans-Eberhard Longo, Willi Mosch, Adolf Pascher, Gerhard Weil, Klaus Zibert, and Oswald Zimmerl Dec. 1982 94 p refs Transl. into ENGLISH of the mono. "Mikrocomputer-LSI-Bausteine" (West Germany), Apr. 1981 94 p Sponsored in part by the Bundesministerium fuer Forschung und Technologie
(PB83-138603; BMFT-FB-T-81-068) Avail: NTIS HC A05/MF A01 CSCL 09B

In the field of single-chip-microcomputers the development of the nanocomputer was completed. Moreover two application-oriented single-chip-microcomputers for use in entertainment electronic systems were developed. In the area of standard 8 bit microcomputers the authors developed with license the CPU 8085 and started volume production. Beyond that the authors developed peripheral components, for instance a multifunction asynchronous receiver-transmitter-chip. With respect to the 16 bit microprocessors the authors finished the development of the CPU 2016 with success. During the development of the CPU 3016C the original goals with respect to system concept were reached completely and partly with respect to system development. GRA

# 61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

**N83-24191*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
**A STUDY OF THE MUSA RELIABILITY MODEL**
Nov. 1980 95 p refs
(NASA-TM-85304; SEL-80-005; NAS 1.15:85304) Avail: Issuing Activity CSCL 09B

The Musa reliability model is applied to three software projects developed for NASA, with the goal of determining whether the model can be used in this environment as a software management tool. Actual times between failures and their associated run times were fitted to the Musa equation. One purpose of the model is to predict the total number of errors in a piece of software undergoing testing. For the three projects studied, the results for one converge to a value 25% higher than the actual number of errors; the other two do not converge at all. Assumptions underlying the model are discussed, and the characteristics of the environment which affect the assumptions are evaluated. Suggestions are offered as to what changes could be made in the environment to better meet the assumptions. Author

**N83-24192*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
**SOFTWARE ENGINEERING LABORATORY (SEL) DATA BASE ORGANIZATION AND USER'S GUIDE**
Sep. 1981 172 p refs
(NASA-TM-85305; SEL-81-002; NAS 1.15:85305) Avail: Issuing Activity CSCL 09B

The structure of the Software Engineering Laboratory (SEL) data base is described. Each data base file is defined in detail

and provides information about how to access and use the data for both FORTRAN programmers and other users. Several data base reporting programs are also described. Author

**N83-24193*#** National Aeronautics and Space Administration, Washington, D. C.
**AN OVERVIEW OF COMPUTER-BASED NATURAL LANGUAGE PROCESSING**
William B. Gevarter Apr. 1983 52 p refs
(NASA-TM-85635; NAS 1.15:85635) Avail: NTIS HC A04/MF A01 CSCL 09B

Computer based Natural Language Processing (NLP) is the key to enabling humans and their computer based creations to interact with machines in natural language (like English, Japanese, German, etc., in contrast to formal computer languages). The doors that such an achievement can open have made this a major research area in Artificial Intelligence and Computational Linguistics. Commercial natural language interfaces to computers have recently entered the market and future looks bright for other applications as well. This report reviews the basic approaches to such systems, the techniques utilized, applications, the state of the art of the technology, issues and research requirements, the major participants and finally, future trends and expectations. It is anticipated that this report will prove useful to engineering and research managers, potential users, and others who will be affected by this field as it unfolds. Author

**N83-24194*#** SoHaR, Inc., Los Angeles, Calif.
**TRENDS IN SOFTWARE RELIABILITY FOR DIGITAL FLIGHT CONTROL**
Herbert Hecht and Myron Hecht Apr. 1983 23 p refs Sponsored in part by FAA
(NASA Order A-93024-B)
(NASA-CR-166456; NAS 1.26:166456) Avail: NTIS HC A02/MF A01 CSCL 09B

Software error data of major recent Digital Flight Control Systems Development Programs. The report summarizes the data, compare these data with similar data from previous surveys and identifies trends and disciplines to improve software reliability. Author

**N83-24195#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.
**AN OVERVIEW OF THE B PROGRAMMING LANGUAGE OR B WITHOUT TEARS**
L. J. M. Geurts Sep. 1982 13 p ref Submitted for publication
(MC-IW-208/82) Avail: NTIS HC A02/MF A01

The B language is a powerful, easy-to-learn and easy-to-use interactive programming language, designed as a modern alternative to BASIC. An informal introduction to the language is given. M.G.

**N83-24196#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.
**THE REVIEW OF GKS VERSION 7.0, THE FINISHING TOUCH**
P. J. W. tenHagen Nov. 1982 14 p refs Submitted for publication
(MC-IW-210/82) Avail: NTIS HC A02/MF A01

The version of GKS that is to become widely available this month (version 7.2), is the result of yet another intensive review. However, this review was definitely the final one. Moreover, all national bodies actively participating in the development of GKS have decided to adopt GKS as a national standard. The functionality of GKS will strongly influence new graphics hardware and software design. Over the last two years a number of new functions have been introduced into GKS. The nature of the standardization process is such that little of this innovation becomes apparent until it has been accepted by the committee. The new functions and the underlying concepts are presented. Author

**N83-24197#** Research Inst. of National Defence, Stockholm (Sweden).
**COMPUTER SIMULATIONS OF VISUAL MODELS**
Ulf Nilsson, Hans Marmolin, and Sten Nyberg Dec. 1982 22 p refs
(FOA-C-53010-H2) Avail: NTIS HC A02/MF A01

Different visual dysfunctions were simulated by implementing models of the human visual system as image processing algorithms. Visual models are founded on spatial frequency analysis of the observed image in combination with linear and nonlinear spatial filtering. The magnitude of filtering is assumed to be determined by the visual system's Contrast Sensitivity Functions (CSF). CSF describes the contrast sensitivity for vertical gratings with sinusoidal luminance variations of different frequencies. Contrast sensitivity is defined as the reciprocal of the lowest contrast level, at which the subject detects the grating. The loss of sensitivity of high frequencies is mainly assumed to be caused by the visual systems optics and certain neural components while the loss at low frequencies is assumed to be caused by lateral inhibition. B.G.

**N83-24198#** Naval Ocean Systems Center, San Diego, Calif.
**KERNEL ADA PROGRAMMING SUPPORT ENVIRONMENT (KAPSE) INTERFACE TEAM: PUBLIC REPORT, VOLUME 2 Technical Document, 1 Apr. - 28 Oct. 1982**
Patricia A. Oberndorf 28 Oct. 1982 628 p refs
(AD-A123136; NOSC/TD-552-Vol-2) Avail: NTIS HC A99/MF A01 CSCL 09/2

The continuing activities of the Kernel ADA Programming Support Environments (KAPSE) interface team and its industry/academia auxiliary are reported. (ADA is a recent, DOD-developed programming language.) The ADA Joint Program Office (AJPO)-sponsored effort will ensure the interoperability and transportability of tools and data bases among different KAPSE implementations. The effort is the result of a Memorandum of Agreement (MOA) among the three services directing the establishment of an evaluation team, chaired by the Navy, to identify and establish KAPSE interface standards. As with previous ADA-related developments, the widest possible participation is being encouraged to create a broad base of experience and acceptance in industry, academia, and the DOD. Author (GRA)

**N83-24199#** Utah Univ., Salt Lake City. Dept. of Computer Science.
**TRANSFORMATION OF ADA PROGRAMS INTO SILICON Semi-annual Technical Report, 1 Mar. - 31 Oct. 1982**
Elliott I. Organick, Gary Lindstrom, D. K. Smith, P. A. Subrahamanyan, and Tony Carter Nov. 1982 171 p refs
(Contract MDA903-81-C-0411; ARPA Order 4305)
(AD-A122967; UTEC-82-103; SATR-2) Avail: NTIS HC A08/MF A01 CSCL 09/2

This report outlines the beginning steps taken in an integrated research effort toward the development of a methodology, and supporting systems, for transforming ADA programs, or program units, (directly) into corresponding VLSI systems. The time seems right to expect good results. The need is evident; special purpose systems should be realistic alternatives where simplicity, speed, reliability, and security are dominant factors. Success in this research can lead to attractive options for embedded system applications. GRA

**N83-24200#** Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
**AN INTRODUCTION TO AN INTERNATIONAL LOGISTICS LANGUAGE M.S. Thesis**
Elaine Roman and Michael R. Sizemore Sep. 1982 85 p refs
(AD-A122875; AFIT-LSSR-43-82) Avail: NTIS HC A05/MF A01 CSCL 05/7

Over the last few years, increased attention has been given to the need for an unambiguous language in order to develop better communication in the area of Foreign Military Sales. This thesis developed the foundation for a Logistics Fundamental Language by simplifying the English vocabulary used within the International Logistics community. The intent is to make International Logistics documents easier to read, understand and use by those customers within the logistics system. This controlled English consists of a specialized vocabulary of approximately

1100 words selected from Foreign Military Sales documents. Additionally, 360 words of the controlled vocabulary are defined using the restricted vocabulary. The final result of this thesis is not a ready-to-use dictionary, but a foundation for future theses to use and complete the dictionary so it can be used within the International Logistics community. Author (GRA)

**N83-24201#** Naval Training Analysis and Evaluation Group, Orlando, Fla.
**BASIC LANGUAGE FLOW CHARTING PROGRAM (BASCHART)**
Charles C. Johnson, Thomas C. Peeples, and Gary W. Hodak Nov. 1982 74 p
(AD-A122845; TAEG-TN-3-82) Avail: NTIS HC A04/MF A01 CSCL 09/2

Proper computer program documentation is essential to the effective use, maintenance, and modification of computer software. The documentation should be comprised of both user and programmer information and be designed to fill the informational needs of the personnel ultimately responsible for using, maintaining or updating the software. The amount and quality of the software documentation produced are usually dependent on two major factors in the program development cycle: the length of time allotted for development and the number of people assigned to the development effort. Normally, the longer the duration of a project and the larger the software development team, the greater the need for software documentation. Proper documentation (1) provides a means to efficiently monitor and control long-term projects, (2) provides an understandable, transferrable method of communication between the project team members and future users or program modifiers, and (3) reduces the time consuming, labor intensive process of duplicating the development effort if key project members leave or the program is moved to another site and/or the programs require modification or updating.
Author (GRA)

**N83-24202#** Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
**A PRELIMINARY EXPLORATION INTO A STRUCTURAL APPROACH TO SOFTWARE DEVELOPMENT COST ESTIMATION M.S. Thesis**
Otis H. Richards, Jr. Dec. 1982 125 p refs
(AD-A123052; AFIT-LSSR-28-82) Avail: NTIS HC A06/MF A01 CSCL 09/2

Difficulties in planning and scheduling of software development are inherent in the nature of large scale software design projects, and are recognized to be causes of overruns in developmental dollar and manpower costs. The author focuses on improving this undesirable cost behavior by exploring a prospective basis for software development cost estimation that is compatible to the planning and design functions of a project's lower level managers. The author develops a concept that software controls a set of objects to behave in accordance with a desired behavioral pattern defined in a set of design specifications. If the structure of the desirable behavior is a good predictor of the pending software's structure, the author reasons that the structure of the desirable behavior might also serve as a basis of cost estimations techniques that are more consistent with the planning and scheduling needs of intermediate project managers. The author develops a model for establishing a functional structure to the object's desirable behavior, develops software using his model, and measures the correlation between the software's structure and the behavioral structure projected by his model. He concludes that the structure of the desired behavior is insufficient as a single-factor predictor of software structure. GRA

**N83-24203#** Sandia Labs., Albuquerque, N. Mex.
**NON-RECURSIVE LOWPASS DIGITAL-FILTER ALGORITHM**
Rick B. Spielman Nov. 1982 31 p refs
(Contract DE-AC04-76DP-00789)
(DE83-004614; SAND-82-0930) Avail: NTIS HC A03/MF A01

A non-recursive lowpass filter was developed for use with waveform data collected with Tektronix 7912 transient digitizers. The filter subroutine is specifically compatible with Tektronix SPS Basic V02XM.02 software. DOE

**N83-24204#** Sandia Labs., Albuquerque, N. Mex. Storage Batteries Div.
**SOLSTOR II DESCRIPTION AND USER'S GUIDE**
Eugene A. Aronson, David L. Caskey, and Kevin D. Murphy Jun. 1982 140 p refs
(Contract DE-AC04-76DP-00789)
(DE83-000895; SAND-82-0188) Avail: NTIS HC A07/MF A01

Described is a FORTRAN 77 version of the SOLSTOR computer simulation code. The new code, SOLSTOR II, adds capabilities to the original SOLSTOR, which simulates photovoltaic (PV) systems, or wind energy conversion systems (WECS), with or without energy storage. SOLSTOR II allows both WECS and PV arrays to be considered simultaneously. SOLSTOR II minimizes the life cycle cost of providing energy by choosing the optimal solar and/or wind system component sizes. Back-up electricity may be provided either from a utility-grid connection or an on-site generator. In utility connected systems both sell-back and time-of-day rates are considered. DOE

**N83-24205#** Sandia Labs., Albuquerque, N. Mex.
**STATLIB**
Herbert E. Anderson Sep. 1982 65 p
(Contract DE-AC04-76DP-00789)
(DE83-002138; SAND-82-1976) Avail: NTIS HC A04/MF A01

A conversational statistical program library is available for the VAX time-sharing computers which should have general applicability in many areas of the laboratory. The library evolved during the development of the in-hours course, Statistical Design and Analysis, sponsored by the Sandia Laboratories Education Committee. This was an applied statistics course primarily intended for practicing engineers and scientists. Several existing programs were modified for use in the time-sharing mode, and others were designed specifically for the course. Experience has shown, however, that the routines have practical worth beyond the confines of the course. They were designed with the casual computer user in mind so computer comments are terse but explicit, and the user has considerable flexibility in the use of the routines themselves. The library presently comprises some 58 subroutines, of which 15 are conversational and argument-free. The latter are considered the library proper, and are discussed in detail in this document. More knowledgeable programmers could also make use of some of the other support routines if desired. An abbreviated list of these is included as Appendix A. Further information on these may be obtained from the author. Other subroutines may be added to the library as they are deemed suitable for inclusion. DOE

**N83-24206#** Edgerton, Germeshausen and Grier, Inc., Las Vegas, Nev.
**IMPLEMENTING A STRUCTURED PROCESS-CONTROL LANGUAGE WITH MACROS**
Robert Ritenour 1982 24 p Presented at the Spring DECUS Symp., Atlanta, 10 May 1982
(Contract DE-AC08-76NV-01183)
(DE82-021366; EGG-1183-1841; CONF-820515-8) Avail: NTIS HC A03/MF A01

Implementing a high level language for a specialized application doesn't have to be a major undertaking. The tools provided by PDP-11 Macro assembler make it possible to create very readable block structured programs. Such a language was devised so that Lawrence Livermore Chemists could describe procedures for controlling gas flow in their gas analysis system. The language implementation is discussed and it is shown how to make an assembly-time stack to implement the control structures of the language. DOE

**N83-24207#** Sandia Labs., Albuquerque, N. Mex.
**STRATAPAX COMPUTER PROGRAM UPDATE**
E. A. Aronson, K. G. McCaughey, and E. L. Walton Sep. 1982 48 p refs
(Contract DE-AC04-76DP-00789)

(DE83-002191; SAND-82-1087) Avail: NTIS HC A03/MF A01

Continuing effort in developing the interactive STRATAPAX drill bit program is reported. The program incorporates an integration method that is independent of the cutter shape. Cutter shapes can be taken to be ellipses to account for varying backrake angles. During the integration procedure derivatives are found which are used in the optimization routine, an iterative linear program used to optimize cutter placement. DOE

**N83-24208#** Alaska Univ., Fairbanks. Geophysical Inst.

**LARGE-SCALE PARTICLE SIMULATIONS IN A VIRTUAL-MEMORY COMPUTER**

P. C. Gray, J. S. Wagner (Texas Univ., Austin), T. Tajima (Texas Univ., Austin), and R. Million Aug. 1982 37 p refs

(Contract DE-FG05-80ET-53088)
(DE82-021224; DOE/ET-53088/64; IFSR-64) Avail: NTIS HC A03/MF A01

Virtual memory computers are capable of executing large-scale particle simulations even when the memory requirements exceed the computer core size. The required address space is automatically mapped onto slow disc memory by the operating system. When the simulation size is very large, frequent random accesses to slow memory occur during the charge accumulation and particle pushing processes. Accesses to slow memory significantly reduce the execution rate of the simulation. It is demonstrated that with the proper choice of sorting algorithm, a nominal amount of sorting to keep physically adjacent particles near particles with neighboring array indices can reduce random access to slow memory, increase the efficiency of the I/O system, and hence, reduced the required computing time. DOE

**N83-24209#** Oak Ridge National Lab., Tenn.

**USER'S GUIDE TO THE AIM COMPUTER PROGRAM PACKAGE**

C. R. Hudson, II Sep. 1982 21 p ref

(Contract W-7405-eng-26)
(DE83-000381; ORNL/TM-8219-R1) Avail: NTIS HC A02/MF A01

A series of interactive computer programs has been developed to assess and rank any number of availability improvement alternatives. This program package is based on the Availability Improvement Methodology developed by Trident Engineering Associates. This guide provides information on how to run the programs and how they are configured. DOE

**N83-24210#** California Univ., Livermore. Lawrence Livermore Lab.

**STREAMS AND ITERATION IN VAL ADDITIONS TO A DATA-FLOW LANGUAGE**

James R. McGraw and Stephen K. Skedzielewski 1982 11 p refs Presented at the 3d Intern. Conf. on Distributed Computing Systems, Miami, Fla., 18 Oct. 1982

(Contract W-7405-eng-48)
(DE82-012260; UCRL-87414; CONF-821002-1) Avail: NTIS HC A02/MF A01

Several proposals for modifications and extensions to the VAL languages are proposed. First, a modification of the iteration construct to improve readability is proposed. Second, extensions to the language to allow streams are proposed. The stream additions enhance possibilities for pipeline concurrency and allow input and output to be specified. DOE

**N83-24211#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.

**PROCESSES AND A FAIR SEMANTICS FOR THE ADA RENDEZVOUS**

J. W. deBakker and J. I. Zucker (State Univ. of New York, Buffalo) Nov. 1982 27 p refs Submitted for publication

(MC-IW-212/82) Avail: NTIS HC A03/MF A01

Processes are mathematical objects which are elements of domains. Process domains are obtained as solutions of equations solved by techniques from metric topology. Such processes are used to assign meanings to languages with concurrency, culminating in a definition of the ADA rendezvous. An important intermediate step is a version of Hoare's communicating sequential processes (CSP) for which we describe a process semantics and which is used as target for the translation of the ADA fragment. Furthermore, some ideas are presented on a mathematically tractable treatment of fairness in the general framework of processes. Author

# 62 COMPUTER SYSTEMS

Includes computer networks.

**N83-24212*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

**DIGITAL SYSTEM UPSET. THE EFFECTS OF SIMULATED LIGHTNING-INDUCED TRANSIENTS ON A GENERAL-PURPOSE MICROPROCESSOR**

Celeste M. Belcastro Apr. 1983 33 p refs

(NASA-TM-84652; NAS 1.15:84652) Avail: NTIS HC A03/MF A01 CSCL 12A

Flight critical computer based control systems designed for advanced aircraft must exhibit ultrareliable performance in lightning charged environments. Digital system upset can occur as a result of lightning induced electrical transients, and a methodology was developed to test specific digital systems for upset susceptibility. Initial upset data indicates that there are several distinct upset modes and that the occurrence of upset is related to the relative synchronization of the transient input with the processing sate of the digital system. A large upset test data base will aid in the formulation and verification of analytical upset reliability modeling techniques which are being developed. Author

**N83-24213#** California Univ., Livermore. Lawrence Livermore Lab.

**VALIDATION OF A DISCRETE EVENT COMPUTER MODEL OF NETWORK SYSTEMS CORPORATION'S HYPERCHANNEL**

W. Bruce Watson 21 Jun. 1982 17 p refs Presented at the 7th Local Computer Networks Conf., Minneapolis, 12 Oct. 1982

(Contract W-7405-eng-48)
(DE82-019107; UCRL-87759; CONF-821006-3) Avail: NTIS HC A02/MF A01

Performance measurements of Network Systems Corporation's Hyperchannel have validated its discrete event simulation in use at the Lawrence Livermore National Laboratory (LLNL). Two independent groups performed the measurements: one at the University of Minnesota and the other at LLNL. DOE

**N83-24214#** California Univ., Livermore. Lawrence Livermore Lab.

**A SECURITY POLICY FOR DISTRIBUTED SYSTEMS**

J. Fletcher 6 Apr. 1982 16 p

(Contract W-7405-eng-48)
(DE82-022517; UCID-19544) Avail: NTIS HC A02/MF A01

This security policy for distributed computing systems is modeled after the security considerations that apply to the noncomputer world of human beings, paper documents, and lockable repositories. However, the computer world differs from the noncomputer world in significant ways, and one should not expect a full analogy between them in regard to security matters. For example, the distinctions among looking at a document, keeping it, and copying it are easily made in the noncomputer world but are difficult or even impossible to make in the computer world. A distributed computing environment involves concepts which are relevant to an exposition of its security policy. DOE

# 63 CYBERNETICS

Includes feedback and control theory.

For related information see also *54 Man/System Technology and Life Support.*

**N83-24215#** Rochester Univ., N. Y. Dept. of Computer Science.

**MEMORY AND CHANGE IN CONNECTION NETWORKS**
Jerome A. Feldman Dec. 1981 44 p refs
(Contracts N00014-78-C-0164; N00014-80-C-0197; Grant NSF MCS-81-04008)
(TR-96) Avail: NTIS HC A03/MF A01

Artificial intelligence and articulating cognitive sciences employ models based on conventional digital computers as theories of intelligent behavior. However, a number of crucial phenomena have not yielded to this treatment. The alternative of employing massively parallel connectionist models (CM) was explored. The foundations for detailed modeling and application of these ideas to a number of difficult problems in vision had considerable success, but all of the detailed technical work was concerned with the struture and behavior of fixed networks. The methodology to cover several aspets of change and memory was investigated. General mechanisms that appear to be applicable in a wide range of modeling tasks are emphasized. E.A.K.

**N83-24216#** European Space Agency, Paris (France).
**SYNTHESIS OF NON-INTERACTING CONTROLS FOR LINEAR AND NONLINEAR SYSTEMS**
Omer Mercier Nov. 1982 70 p refs Transl. into ENGLISH from 'Calcul de Commandes Non-interactives pour les Systems Lineaires et Non-lineaires" ONERA, Paris Rept. ONERA-NT-1981-6, 1981 (ESA-TT-760; ONERA-NT-1981-6) Avail: NTIS HC A05/MF A01

Practical methods to synthesize decoupled, or non-interacting controls for a wide variety of linear and nonlinear dynamical systems are summarized. Using these controls, individual system outputs are independently controlled. In addition, the poles of the closed-loop controlled system may be in general arbitrarily assigned to satisfy regulation quality criteria. For each class of systems under consideration and for each control type, numerical examples are given to illustrate the methods and to facilitate understanding of theoretical developments. In the particular case of nonlinear systems, the theory is illustrated by an application to the attitude control of an aerospace vehicle with complex and large amplitude commanded slewing motions. Robustness properties of this control law are especially studied. In its application to linear systems, decoupling control theory is competing with equally attractive methods; in the case of nonlinear systems, no other method is known to synthesis an explicit closed-loop control law which, beyond decoupling, ensures a stable behavior for the controlled system. M.G.

**N83-24217#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Operations Research.
**FEEDBACK DECOMPOSITION OF NONLINEAR CONTROL SYSTEMS**
H. Nijmeijer Oct. 1982 9 p refs Submitted for publication
(MC-BW-169/82) Avail: NTIS HC A02/MF A01

By using the recently developed (differential) geometric approach to nonlinear systems a feedback decomposition for nonlinear control systems is derived. Author

**N83-24218#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Operations Research.
**THE TRIANGULAR DECOUPLING PROBLEM FOR NONLINEAR CONTROL SYSTEMS**
Henk Nijmeijer Nov. 1982 14 p refs Submitted for publication
(MC-BW-171/82) Avail: NTIS HC A02/MF A01

A solution of the triangular decoupling problem (T.D.P.) for nonlinear control systems is presented. This problem was solved completely for linear systems by using the geometric approach. It is shown that the differential geometric approach to nonlinear systems enables one to solve the nonlinear T.D.P. locally. As a final result a simple but illustrative example is given. M.G.

**N83-24219#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Operations Research.
**THE LAGRANGE MULTIPLIER RULE ON MANIFOLDS AND OPTIMAL CONTROL OF NONLINEAR SYSTEMS**
J. C. P. Bus Dec. 1982 38 p refs Submitted for publication
(MC-BW-175/82) Avail: NTIS HC A03/MF A01

A differential geometric approach to the Lagrange problem and the fixed end points, fixed time optimal control problem for nonlinear time-invariant control systems is presented. Attention is restricted to first order conditions for optimality. The treatment of the optimal control problem uses a recently proposed fiber bundle approach for the definition of nonlinear systems. M.G.

# 64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

**N83-24220** International Inst. for Applied Systems Analysis, Laxenburg (Austria).
**PROGRESS IN NONDIFFERENTIABLE OPTIMIZATION**
E. A. Nurminski, ed. 1982 267 p refs
(IIASA-CP-82-S8; ISSN-3-7045-0050-X) Copyright. Avail: Issuing Activity

Methods of nondifferentiable and stochastic optimization and their applications, acceleration in the relaxation method for linear inequalities and subgradient optimization, convergence of a modification of Lemavechal's algorithm for nonsmooth optimization, subgradient method for minimizing weakly convex functions and epsilon-subgradient methods of convex optimization, favorable classes of Lipschitz-continuous functions in a subgradient optimization, nondifferentiable functions in hierarchical control problems, lagrangian functions and nondifferentiable optimization, and a bibliography on nondifferentiable optimization are presented.
Author

**N83-24221#** Technion - Israel Inst. of Tech., Haifa. Dept. of Aeronautical Engineering.
**SOLUTION OF 3-DIMENSIONAL INTERCEPTION BY INCLINED PLANE USING THE FORCED SINGULAR PERTURBATIONS TECHNIQUE**
M. Negrin and J. Shinar Feb. 1982 37 p refs Presented at the 24th Israel Ann. Conf. on Aviation and Astronautics, 17-18 Feb. 1982
(TAE-479) Avail: NTIS HC A03/MF A01

Approximate solution of 'minimum time medium range' interception can be obtained in feedback form by using the 'forced singular perturbations technique' and by determining a desired inclined plane in which the interceptor can successfully complete its mission. This closed loop solution is a very attractive candidate for real time airborne implementation. Examples of three dimensional interceptions with a realistic aerodynamics and propulsion model are analysed. Comparison with the exact numerical solution and another approximate solution indicates that the accuracy of the inclined plane solution is satisfactory. M.G.

**N83-24222#** Sheffield Univ. (England). Dept. of Control Engineering.
**DELAY EQUATIONS, THE LEFT-SHIFT OPERATOR AND THE INFINITE-DIMENSIONAL ROOT LOCUS**
S. P. Banks and F. Abbasi-Ghelmansarai 1982 20 p refs
(RR-192) Avail: NTIS HC A02/MF A01

The distributed parameter root locus is considered and a relation between simple delay equations and the left-shift operator is developed. This gives a rigorous explanation of the s-plane behavior of delay systems and shows that the classical root locus starting on the open loop holes of the system can become bands swept out by connected components of the spectrum of the system operator in the infinite-dimensional case. M.G.

**N83-24223#** European Space Agency, Paris (France).
**ON THE COMPUTATION OF WEAK SOLUTIONS OF HYPERBOLIC SYSTEMS OF CONSERVATION LAWS BY DIFFERENCE SCHEMES**
A. Lerat Dec. 1982 260 p refs Transl. into ENGLISH from "Sur le Calcul des Solutions Faibles des Systemes Hyperboliques

de Lois de Conservation a l'aide de Schemas aux Differences", ONERA, Paris Rept. ONERA-NT-1981-1
(ESA-TT-762; ONERA-NT-1981-1) Avail: NTIS HC A12/MF A01

Numerical methods for compressible fluid dynamics is discussed. The approximation of weak solutions of hyperbolic systems of conservation laws by finite difference schemes in conversation form is presented. These schemes allow the computation of discontinuity waves with no need of special treatment, but involve some shortcomings such as the appearance of spurious oscillations in the vicinity of shocks and contact discontinuities. These short comings were analyzed by means of the equivalent system approach which reduces the study of numerical schemes to the one of partial differential equations including the terms of the exact system and additional terms standing for the approximation error. Author

**N83-24224#** Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
**A FAST PLOTTING ALGORITHM FOR FINITE ELEMENT TYPE MESHES**
Daniel Louis 1982 16 p refs In FRENCH; ENGLISH summary Report will also be announced as translation (ESA-TT-813)
(ONERA-NT-1982-5; ISSN-0078-3781; ESA-TT-813) Avail: NTIS HC A02/MF A01

A fast plotting algorithm for structural meshes, which result from a two dimensional or three dimensional discretization by means of finite elements is presented. The mesh is considered as a geometric representation of a simply connected symmetric graph, and the optimization of the plot is treated as the search for simple chains in the graph. The proposed algorithm, which is independent of the plotter type, is especially in display on a graphic terminal. Author

**N83-24225#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Sciences.
**LINEAR TIME AND BRANCHING TIME SEMANTICS FOR RECURSION WITH MERGE**
J. W. deBakker, J. A. Bergstra, J. W. Klop, and J.-J. C. Meyer (Free Univ., Amsterdam) Nov. 1982 29 p refs Submitted for publication
(MC-IW-211/82) Avail: NTIS HC A03/MF A01

Two ways of assigning semantics to a class of statements built from a set of atomic actions (the 'alphabet'), by means of sequential composition, nondeterministic choice, recursion, and merge (arbitrary interleaving) are considered. The first is linear time semantics (LT), stated in terms of trace theory; the semantic domain is the collection of all closed sets of finite and infinite words. The second is branching time semantics (BT), as introduced by de Bakker and Zucker; here the semantic domain is the metric completion of the collection of finite processes. For LT, the continuity of the operations (merge, sequential composition) is proved in a direct, combinatorial way. Next, a connection between LT and BT is established by means of the operation trace which assigns to a process its set of traces. It is shown that the trace set of a process is closed and that trace is continuous. This requires the compactness of the semantic domains, ensured by the finiteness of the alphabet. Using trace, BT is then carried over into LT. M.G.

**N83-24226#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.
**FACTORING POLYNOMIALS OVER ALGEBRAIC NUMBER FIELDS**
A. K. Lenstra Nov. 1982 24 p refs Submitted for publication
(MC-IW-213/82) Avail: NTIS HC A02/MF A01

A polynomial-time algorithm for the factorization of polynomials in one variable with coefficients in an algebraic number field is described. The algorithm generalizes the polynomial-time algorithm for the factorization of polynomials in one variable with rational coefficients. M.G.

**N83-24227#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.
**INCREMENTAL POLYMORPHIC TYPE CHECKING IN B**
L. G. L. T. Meertens Nov. 1982 14 p refs Presented at 9th Ann ACM Symp. on Principles of Programming Languages, 1983 Submitted for publication
(MC-IW-214/82) Avail: NTIS HC A02/MF A01

The programming language B has been designed for personal computing. In B, variables need not be declared, nor formal parameters specified. Nevertheless, B is strongly typed. All type requirements can be checked statistically. To signal type violations on the sot during editing, the computations can be organized so that local modifications to the source text require a modest amount of recomputation. Author

**N83-24228#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
**PREDICTOR-CORRECTOR METHODS WITH IMPROVED ABSOLUTE STABILITY REGIONS**
P. J. vanderHouwen and B. P. Sommeijer Sep. 1982 42 p refs Submitted for publication
(MC-NW-137/82) Avail: NTIS HC A03/MF A01

Generalized predictor-corrector methods are studied with an extended region of absolute stability. Extrapolation-predictor and backward-differentiation-corrector methods are constructed for orders up to 6, the real stability boundaries of which are of magnitude m(2), where m is the number of right-hand side evaluations per integration step. The coefficients of the method can be generated during the computation for arbitrary values of m. The storage requirements are limited and independent of m. The method is particularly suited for the integration of semi-discrete parabolic differential equations in more space dimensions. M.G.

**N83-24229#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
**ON THE ITERATION ERROR IN ALGEBRAICALLY STABLE RUNGE-KUTTA METHODS**
K. Dekker Sep. 1982 15 p refs Submitted for publication
(MC-NW-138/82) Avail: NTIS HC A02/MF A01

In the implementation of implicit Runge-Kutta methods inaccuracies are introduced due to the solution of the implicit equations. It is shown that the effect of these errors remains bounded, provided that a dissipative equation is solved with an algebraically stable method which satisfies an additional condition. Moreover, the implicit equations have a unique solution when this condition is satisfied. M.G.

**N83-24230#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
**THE USE OF DEFECT CORRECTION FOR THE SOLUTION OF A SINGULARLY PERTURBED ODE**
P. W. Hemker Oct. 1982 16 p refs Submitted for publication
(MC-NW-139/82) Avail: NTIS HC A02/MF A01

Some results for the numerical solution of singularly perturbed two point boundary value problems are summarized. The effect of central and one sided differences is shown. The defect correction process, using both discrete operators, is explained. Also a mixed defect correction process is shown, which is both accurate for the smooth and stable for the unsmooth components in the solution. The latter method applies equally well to partial differential equations. The results are given for a model problem in one space dimension. Application in an adaptive procedure is mentioned. Author

**N83-24231#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
**A SURVEY OF ONE-STEP SPLITTING METHODS FOR SEMI-DISCRETE FIRST ORDER HYPERBOLIC PARTIAL DIFFERENTIAL EQUATIONS**
H. B. deVries Nov. 1982 22 p refs Submitted for publication
(MC-NW-141/82) Avail: NTIS HC A02/MF A01

Splitting methods are discussed for first order hyperbolic partial differential equations via the method of lines, and in particular the time integration is discussed. A class of one-step integration formulas is defined, which is shown to contain several well-known

splitting methods. For a number of methods stability results are given. M.G.

**N83-24232#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Operations Research.
**ON OSCILLATION PROPERTIES AND THE INTERVAL OF ORTHOGONALITY OF ORTHOGONAL POLYNOMIALS**
E. A. vanDoorn Dec. 1982 34 p refs Submitted for publication (MC-BW-173/82) Avail: NTIS HC A03/MF A01

The true interval of orthogonality for a sequence of orthogonal polynomials, which is the smallest closed interval containing the limit points of the set of zeros of the polynomials, is addressed. Bounds are given for the endpoints of this interval in terms of the coefficients in the three term recurrence formula and they are shown to be generalizations of most existing results. Similar findings are reported for the limit interval of orthogonality, which is defined as the smallest closed interval containing the derived set of the set of limit points. The bounds are based upon an oscillation theorem for orthogonal polynomials which is of independent interest. M.G.

**N83-24233#** Ecole Nationale Superieure des Telecommunications, Paris (France). Dept. Systemes et Communications.
**IDENTIFICATION OF NON-STATIONNARY AUTOREGRESSIVE MOVING AVERAGE (ARMA) MODELS [IDENTIFICATION DE MODELES ARMA NON STATIONNAIRES]**
Yves Grenier 1982 21 p refs In FRENCH; ENGLISH summary Presented at Colloq. CNRS on Algorithmes Rapides pour le Traitment des Systemes Lineaires, Aussois, France, 21-25 Sep. 1982
(ENST-C-82004) Avail: NTIS HC A02/MF A01

The extension of autoregressive moving average (ARMA) models to the analysis of non-stationary processes is discussed and some algorithms for the estimation of the parameters in these models are developed. The autoregressive part of the model is determined by means of Yule-Walker equations which are solved by one of two schemes, depending on the prolongation of the available data by zero. The moving average part is approximated through a long time-varying autoregressive model. M.G.

**N83-24234#** Ecole Nationale Superieure des Telecommunications, Paris (France). Dept. of Systemes et Communications.
**APPLICATION OF LINEAR PREDICTION TO NUMERICAL FILTER SYNTHESIS Ph.D. Thesis [APPLICATION DE LA PREDICTION LINEAIRE A LA SYNTHESE DES FILTRES NUMERIQUES]**
Abd El Rahman Hanafi 1982 307 p refs
(ENST-E-82008) Avail: NTIS HC A14/MF A01

The application of the techniques of linear prediction to the design of one dimensional recursive and nonrecursive digital filters and also to the design of two dimensional recursive digital filters is discussed. The fundamental problem of linear prediction is to determine a linear, shift invariant whitening filter for a given random process. In some cases, the exact spectral density function of the process is known and finding the whitening filter is a deterministic problem. In other cases, only a finite set of samples from the random process is available, and the whitening filter must be estimated. The second class of linear prediction is addressed. Some other applications of linear prediction are Wiener filtering, spectral estimation, and speech processing. S.L.

**N83-24235#** Royal Inst. of Tech., Stockholm (Sweden). Dept. of Strength of Materials and Solids Mechanics.
**EXPERIMENTAL STUDIES OF DIFFERENT INSTABILITY CRITERIA BASED ON THE J-R CURVE**
Sten Kaiser Nov. 1981 43 p refs
(Contract STU-80-3850)
(TRITA-HFL-0034; Publ-214; ISSN-0349-1234) Avail: NTIS HC A03/MF A01

A general instability condition of solid mechanics, valid for a non-linear structural component in an otherwise elastic system is shown to be inherent in the T modulus concept of instability. This condition postulates instability when the compliance of the elastic system exceeds the slope of the descending part of the load displacement curve. This slope can therefore be used to evaluate T sub appl at instability. Evaluations are done for large panel specimen and for smaller bend and CT specimen for three structural steels. The obtained data are in good agreement with conventionally determined data. Author

**N83-24236#** Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
**EXISTENCE THEOREMS FOR THE LINEAR, SPACE-INHOMOGENEOUS TRANSPORT EQUATION**
Rolf Pettersson 1982 40 p refs
(CTH-Math-1982-D) Avail: NTIS HC A03/MF A01

Existence problems in L(1) for the linear, space-inhomogeneous Boltzmann equation with periodic or (perfectly) absorbing boundary conditions under realistic assumptions on the cross-sections are studied. By an iteration technique, solutions are first constructed to an integral equation variant of the transport equation in the case of bounded impact parameters and a L(1) type of cross-sections. They are then used to study the existence of solutions of a measure form of the transport equation in the case of unbounded impact parameters. These solutions conserve mass. Estimates of their higher moments are also given. In particular the results hold for inverse k(th)-power forces with $3 < k < \text{or} = 5$. M.G.

**N83-24237#** Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
**SOME DIRICHLET SERIES WHOSE POLES ARE RELATED TO CUSP FORMS (PART 2)**
Dennis A. Hejhal (Minnesota Univ., Minneapolis) 1982 27 p refs
(Grant NSF MCS-78-27377)
(CTH-Math-1982-13) Avail: NTIS HC A03/MF A01

A mathematical analyses was performed to obtain some sensible estimates for the underlying Dirichlet series. Results are presented in outline form. A comprehensive discussion of all this material will be published elsewhere. L.F.M.

**N83-24238#** Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematiques.
**ON THE H-FUNCTION AND CONVERGENCE TOWARDS EQUILIBRIUM FOR A SPACE-HOMOGENEOUS MOLECULAR DENSITY**
Tony Elmroth 1982 17 p refs
(CTH-Math-1982-14) Avail: NTIS HC A02/MF A01

The results about the H function for space homogeneous moleclar velocity distributions and the convergence of such distributions towards the equilibrium distribution for the Boltzmann equation are presented. Author

**N83-24239#** Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
**IMPROVED ACCURACY BY ADAPTED MESH-REFINEMENTS IN THE FINITE ELEMENT METHOD**
Kenneth Eriksson 1982 43 p refs
(CTH-Math-1982-14) Avail: NTIS HC A03/MF A01

For appropriately adapted mesh-refinements, optimal order error estimates are proved for the finite element aproximate solution of the Neumann problem for the second order elliptic equation Lu = Delta where Delta is the Dirac distribution. M.G.

**N83-24240#** Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
**A SURVEY OF PUBLICATIONS ON SUNERO-AKKADIAN MATHEMATICS, METROLOGY, AND RELATED MATTERS (1854-1982)**
Joeran Friberg Sep. 1982 172 p refs Sponsored by Anna Ahrenbergs Fond foer Vetenskapliga m.fl. Aedamaal, Assoc. Franco-Suedoise pour la Recherche, Kungl. och Hvitfeldtska Stipendieinraettningen, Kungl. Ventenkaps - och Vitterhetssaelskapet i Goeteborg, and Laengmanska Kulturfonden
(CTH-Math-1982-17) Avail: NTIS HC A08/MF A01

Cuneiform mathematical texts began at an early stage of the history of Assyriology. A tablet from Senkereh contained on one side tables of cubes, squares, and square roots and on the other side Metrological Tables for length measures. Such metrological tables were understood to be aids for the conversion of quantities expressed in the various units of a measure system into Sexaqesimal multiples of some basic unit, all for easier computation. The multiple of complicated systems of notations used in the cuneiform texts for numbers as well as for measures of length, area, weight, and capacity were studied. The few preserved metrological tables that were found in excavations were studied and also a wealth of other Assyrian, Babylonian and Sumerian documents. Author

**N83-24241#** Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
**CAPACITARY INEQUALITIES OF THE BRUNN-MINKOWSKI TYPE**
Christer Borell 1982 13 p refs
(CTH-Math-1982-18) Avail: NTIS HC A02/MF A01

A construction method of alpha proportion-concave capacities built up from Newton capacity is given, and also some examples. Among other things, there is given a Brunn-Minkowski inequality for the capacity of a plate condenser in 3-space. B.G.

**N83-24242#** Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
**RATIONAL APPROXIMATION OF ANALYTIC FUNCTIONS**
Johan Karlsson 1982 10 p refs
(CTH-Math-1982-19) Avail: NTIS HC A02/MF A01

In recent years considerable progress was made on the question of what should replace the classical Bernstein and Jackson theorems when approximating by rationals. Analogous results for functions analytic in the unit disk with restrictions on the variation on the boundary are proved. For the polynomial approximation of functions analytic in the unit disc and continuous on the closed disk, complete analogs of Bernstein and Jackson hold. B.G.

**N83-24243#** Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
**A NON-INTERPOLATION: RESULT FOR NONLINEAR MAPPINGS BETWEEN SOBOLEV SPACES**
Peter Kumlin 1982 50 p refs
(CTH-Math-1982-20) Avail: NTIS HC A03/MF A01

The conditions for nonlinear mappings between Sobolev spaces are given. Mappings will be bounded if f is a polynomial of prescribed maximal degree, e.g., only if f is linear. Such results provide non-interpolation theorems for these mappings and so for example severly limits the application of certain techniques used in the study of global existence of smooth solutions to nonlinear wave and Schroedinger equations. These results are extended to a class of nonlocalized mappings of Hartree-type. Author

**N83-24244#** Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
**DUALITY FOR THE DE RHAM-WITT COMPLEX**
Torsten Ekedahl 1982 69 p refs
(CTH-MATH-1982-21) Avail: NTIS HC A04/MF A01

For X a smooth and proper equidimensional variety X over a perfect field of positive characteristic a duality theorem is shown for the cohomology of the de Rham-Witt complex of X. The theorem takes the form of a canonical isomorphism R Gamma(W omega sub X dot) leads to D(R Gamma(W Omega sub X dot)), where D(-) is an appropriate dualizing functor on an appropriate triangulated category. M.G.

**N83-24245#** Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
**ON COUPLING OF BROWNIAN MOTIONS**
Torgny Lindvall 1982 15 p refs
(CTH-Math-1982-23) Avail: NTIS HC A02/MF A01

A technique to couple Brownian motions in R(n) and on, e.g., the unit sphere is introduced. After some examples of applications, among them to the N free particles model and simple potential theory, the main result is proved. It asserts that weakly recurrent generalized Ornstein-Uhlenbeck processes are ergodic. M.G.

**N83-24246#** Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
**ADAPTED FINITE ELEMENT METHODS OF OPTIMAL ORDER FOR PROBLEMS WITH SINGULAR DATA**
Kenneth Eriksson 1982 27 p refs
(CTH-Math-1982-24) Avail: NTIS HC A03/MF A01

An adapted finite element method is proposed for a class of elliptic problems with singular data. The idea is to subtract the main singularity from the solution and to solve for the remainder using suitable mesh refinements. Optimal order error estimates are proved. Author

**N83-24247#** Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
**ON WEIGHTED L SUP P- L SUB P, -ESTIMATES FOR THE KLEIN GORDON EQUATION**
Philip Brenner 1982 8 p refs
(CTH-Math-1982-25) Avail: NTIS HC A02/MF A01

Weighted norm estimates are derived for the Klein-Gordon equation. Such results are of particular interest in cases where the wave operator d(2)sub t-delta is replaced by d(2)sub t-w(-1)d sub x(wd sub x) and should in such cases allow a detailed analysis of the asymptotic behavior of the solutions of the modified equation. M.G.

**N83-24248#** Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
**FATOU THEOREMS AND MAXIMAL FUNCTIONS FOR EIGEN FUNCTIONS OF THE LAPLACE-BELTRAMI OPERATOR IN A BIDISK**
Peter Sjoergen 1982 25 p refs
(CTH-Math-1982-26) Avail: NTIS HC A02/MF A01

Karpelevic determined the Martin boundary X for the eigenfunctions of the Laplace-Beltrami operator in a bidisk. Any f is an element of L(1)(X) gives rise to an eigenfunction, by integration against a kernel. It is shown that a.a. values of f can be recovered as the limit of the corresponding normalized eigenfunction along certain geodetic curves. This answers a question of Koranyi and extends results due to Linden. The proof uses a maximal function in three dimensions, which is not invariant under translation. A theorem on weakly restricted convergence for the square root of the product Poisson kernel is also proved. M.G.

**N83-24249#** Arizona State Univ., Tempe. Dept. of Electrical and Computer Engineering.
**SPECTRAL ESTIMATION: AN OVERDETERMINED RATIONAL MODEL EQUATION APPROACH Final Report, 30 Sep. 1981 - 15 Aug. 1982**
James A. Cadzow 15 Sep. 1982 110 p refs
(Contract N00014-82-K-0257; Grant AF-AFOSR-0250-81; AF Proj. 2305)
(AD-A123122; AFOSR-82-1050TR) Avail: NTIS HC A06/MF A01 CSCL 12/1

In seeking rational models of time series, the concept of approximating second order statistical relationships (i.e., the Yule-Walker equations) is often explicitly or implicitly invoked. The parameters of the hypothesized rational model are typically selected so that these relationships best represent a set of autocorrelation lag estimates computed from time series observations. One of the objectives of this report will be that of establishing this fundamental approach to the generation of rational models. An examination of many popular contemporary spectral estimation methods reveals that the parameters of a hypothesized rational model are estimated upon using a minimal set of Yule-Walker equation evaluations. This results in an undesired parameter hypersensitivity and a subsequent decrease in estimation performance. GRA

**N83-24250#** Colorado State Univ., Fort Collins. College of Forestry and Natural Resources.
**MATHEMATICAL STRUCTURE OF ELECTROMAGNETIC TERRAIN FEATURE CANOPY MODELS Final Report, Sep. 1979 - Sep. 1982**
J. A. Smith Nov. 1982 109 p refs
(Contract DAAG29-79-C-0199)
(AD-A122940; ARO-16628.5-GS) Avail: NTIS HC A06/MF A01 CSCL 12/1

The primary objective of the work undertaken in this project was to review the mathematical structure and physical concepts inherent in optical electromagnetic vegetation canopy models. New formulations of both reflective and thermal existence models were developed which factor canopy geometric dependent-terms from basic optical properties. GRA

**N83-24251#** Stanford Univ., Calif. Dept. of Statistics.
**RANK ADDITIVITY AND MATRIX POLYNOMIALS**
George P. H. Styan and Akimichi Takemura (McGill Univ.) Sep. 1982 18 p refs Sponsored in part by the Natural Sciences and Engineering Research Council of Canada
(Contracts DAAG29-82-K-0156; N00014-75-C-0442)
(AD-A122943; SU-TR-4; SU-TR-57; ARO-19065.6-MA) Avail: NTIS HC A02/MF A01 CSCL 12/1

Various results are given concerning the logical relation between the rank additivity condition of matrices and polynomial equations satisfied by these matrices, generalizing earlier results on idempotent, tripotent, and r-potent matrices. Author (GRA)

**N83-24252#** Stanford Univ., Calif. Dept. of Computer Science.
**NUMERICAL METHODS FOR SOLVING LEAST SQUARES PROBLEMS Final Report**
Gene H. Golub 1982 9 p refs
(Contract DAAG29-81-C-0019)
(AD-A122945; ARO-16037.9-MA) Avail: NTIS HC A02/MF A01 CSCL 12/1

We have studied a number of computational problems in numerical linear algebra. Most of these problems arise in statistical computations. They include the following: (1) Application of the conjugate gradient method to nonorthogonal analysis of variance; (2) Use of orthogonalization procedures in geodetic problems; (3) Algorithms for computing sample variance; (4) Truncated Newton methods; and (5) Imposing Curvature Restrictions on Flexible Functional Forms. Author (GRA)

**N83-24253#** Dundee Univ. (Scotland).
**CONFERENCE ON ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS**
2 Apr. 1982 35 p refs Conf. held 29 Mar. - 2 Apr. 1982
(AD-A122863) Avail: NTIS HC A03/MF A01 CSCL 12/1

In this paper, we consider the asymptotic stability for equations via the Lyapunov-Razumikhin approach. For the case when Tau = 0, a Lyapunov function is constructed and conditions which reduce to the generalized Routh-Hurwitz criteria for uniform asymptotic stability are obtained. The constructed Lyapunov function is also converted to a Lyapunov functional. This functional is used to give necessary conditions on a, b and h for which equation (*) is asymptotically stable. Author (GRA)

**N83-24254#** North Carolina Univ., Chapel Hill.
**NUMERICAL METHODS FOR CONSTRAINED AND UNCONSTRAINED OPTIMIZATION Final Report, 15 Apr. 1977 - 30 Sep. 1982**
Paul T. Boggs and Jon W. Tolle 23 Dec. 1982 9 p
(Grants DAAG29-77-G-0125; DAAG29-79-G-0014; DAAG29-79-D-1002)
(AD-A122912; ARO-15157.8-MA) Avail: NTIS HC A02/MF A01 CSCL 12/1

The main thrust of the research has been toward the development of efficient algorithms for solving the finite - dimensional constrained optimization problem. Historically, problems of this type have been solved by either penalty function methods or through linearization procedures. The fact that neither of these techniques is completely satisfactory for general nonlinear problems has lead to a concentrated research effort to find better approaches. What has so far emerged from this work is a blending of the penalty function land linearization ideas with the quadratic approximation methods associated with unconstrained optimization. While there remain many unresolved issues, it is now apparent that this synthesis has resulted in more efficient algorithms for the nonlinear constrained optimization problem. Author (GRA)

**N83-24255#** Massachusetts Inst. of Tech., Cambridge. Dept. of Mathematics.
**NUMERICAL ANALYSIS AND NONLINEAR MECHANICS Final Report, 1 Jul. 1980 - 30 Sep. 1982**
W. Gilbert Strang Dec. 1982 9 p refs
(Contract DAAG29-80-K-0033)
(AD-A122913; ARO-17256.11-MA; MIT-89611; Rept-1) Avail: NTIS HC A02/MF A01 CSCL 12/1

We have begun an analysis of the optimal design of structure in mechanics and biomechanics, with emphasis on materials which do not satisfy Hooke's law. Our research has been partly numerical and partly analytical; the optimal design problem is highly nonlinear with respect to variations in the geometry, and this has meant that the construction of efficient algorithms is unusually difficult. Author (GRA)

**N83-24256#** Sandia Labs., Albuquerque, N. Mex. Numerical Mathematics Div.
**LOCAL-ERROR ESTIMATION IN ADAMS CODES**
Lawrence F. Shampine Nov. 1982 33 p refs
(Contract DE-AC04-76DP-00789)
(DE83-004253; SAND-82-2998) Avail: NTIS HC A03/MF A01

Modern codes for the solution of the initial value problem for a system of ordinary differential equations estimate the error made at each step. This local-error estimate is fundamental because it is used to decide whether to accept or reject the step and to adjust the step size to obtain the desired accuracy efficiency. Codes based on the Adams family of formulas are studied. These vary popular codes also very the formula (the order) from step to step. To do this they must estimate what the local error would have been had the step been carried out with any one of several other formulas (orders). DOE

**N83-24257#** Sandia Labs., Albuquerque, N. Mex. Numerical Mathematics Div.
**ROBUST RELATIVE ERROR CONTROL**
Lawrence F. Shampine Nov. 1982 14 p refs
(Contract DE-AC04-76DP-00789)
(DE83-003768; SAND-82-2320) Avail: NTIS HC A02/MF A01

When solving the initial value problem for a system of ordinary differential equations (ODEs), $y' = f(x,y)$ for $A<x<B$, $y(a)$ given, one often has little a priori information about the size of the solution components. A control of the error made at each step of the integration (the local error) relative to the size of the solution during the step is then very appropriate. Such a control is also appropriate in view of the floating point arithmetic used to perform the integration. There are two technical matters which make the implementation of a relative error control awkward. One is to cope with difficulties caused by a solution component which vanishes. A simple device is pointed out which avoids such difficulties. Another matter is to develop a suitable measure of the size of a solution. An interpretation of relative error appropriate to a solution vanishing identically during a step is given, and some reasonable ways to measure the size of non-zero solutions are described. DOE

**N83-24258#** Oak Ridge National Lab., Tenn. Health and Safety Research Div.
**PARAMETER IDENTIFIABILITY FOR PARTIAL DIFFERENTIAL EQUATIONS**
C. C. Travis and L. W. White 1982 2 p refs Presented at the 10th Intern. Math. and Computers Simulations Congr. on Systems Simulation and Sci. Computation, Montreal, 9 Aug. 1982
(Contract W-7405-eng-26; Grant NSF DED-80-21024)

(DE82-0020910; CONF-820810-12) Avail: NTIS HC A02/MF A01

The direct method of parameter identifiability is shown to hold for linear parabolic partial differential equations. This is in contrast to other methods of parameter identifiability which, while they hold for finite dimensional lumped systems, fail to extend to partial differential equations. It is hoped that the diect method will provide some insight into the many unanswered questions concerning parameter identifiability of partial differential equations. DOE

**N83-24259#** Design Sciences, Inc., Sewickley, Pa.
**FAULT TREE ANALYSIS REPORT**
Gary J. Powers and Steven A. Lapp Jun. 1982 156 p refs Prepared for Combustion Engineering, Inc., Windsor, Conn.
(Contract DE-AC02-80CH-10047)
(DE82-020754; DOE/CH-10047/4) Avail: NTIS HC A08/MF A01

Safety and reliability fault trees for the coal gasification process development unit (PDU) were constructed. Detailed fault trees with probability and failure rate calculations were generated for the events: fatality due to explosion, fire, toxic release or asphyxiation at the PDU coal gasification process; and loss of availability of the PDU. The trees were synthesized and subjected to multiple reviews. The steps involved in hazard identification and evaluation, fault tree generation, probability assessment, and design alteration are presented. The fault trees, cut sets, failure rate data and unavailability calculations are included. DOE

**N83-24260#** California Univ., Berkeley. Lawrence Berkeley Lab. Dept. of Mathematics.
**OPTIMAL CHOICE OF DIRECTIONS FOR THE RECONSTRUCTION OF AN OBJECT FROM A FINITE NUMBER OF ITS PLANE INTEGRALS Ph.D. Thesis**
Audrey M. Tam May 1982 98 p refs
(Contract DE-AC03-76SF-00098)
(DE83-000497; LBL-14127) Avail: NTIS HC A05/MF A01

The density of hydrogen nuclei in an object is a function f (x,y,z) with compact support whose plane integrals can be approximated by nuclear magnetic resonance (NMR) measurements. It is shown how a large number of basis polynomials are automatically integrated by formulas which are invariant with respect to the group of rotations associated with one of the regular solids (tetrahedron, octahedron-cube, dodecahedron-icosahedron). Different quadrature formulas were compared by reconstructing a three dimensional model of a human head. DOE

**N83-24261#** Brookhaven National Lab., Upton, N. Y. Medical Dept.
**A NEW APPROACH TO 2D LINEAR INTERPOLATION FOR GEOMETRIC DISTORTION CORRECTION OF IMAGES**
Y. J. C. Bizais, R. W. Rowe, I. G. Zubal, G. W. Bennett, and A. B. Brill 1982 4 p ref Presented at the 1st IEEE Computer Soc. Intern. Conf. on Med. Computer Sci. Computational Med., Philadelphia, 23-25 Sep. 1982
(Contract DE-AC02-76CH-00016)
(DE83-000213; BNL-31849; CONF-820974-1) Avail: NTIS HC A02/MF A01

A 2D interpolation procedure for geometric distortion correction of images is described, and shown to be applicable in the general case where the knots are arbitrarily located. This method leads to a continuous interpolation function, contrary to the usual approach, and exhibits better performance. DOE

**N83-24262#** Los Alamos Scientific Lab., N. Mex. Center for Nonlinear Studies.
**DUAL SPACES OF DIFFERENTIAL LIE ALGEBRAS**
Boris A. Kuperschmidt 1982 10 p refs Presented at the CNLS Order in Chaos Conf., Los Alamos, N. Mex., 24-28 May 1982
(Contract W-7405-eng-36)
(DE83-000650; LA-UR-82-2655; CONF-8205121-5) Avail: NTIS HC A02/MF A01

A mathematical scheme is presented which serves as an infinite-dimensional generalization of Poisson structures on dual spaces of finite-dimensional Lie algebras, which are well known and widely used in classical mechanics. These structures appear in the theory of Lax equations, long waves in hyydrodynamics, and various other physical models: compressible hydrodynamics, magnetohydrodynamics, multifluid plasmas, elasticity, superfluid 4He and 3He-A, Ginzburg-Landau theory of superconductors, and classical chromohydrodynamics (the generalization of plasma physics to Yang-Mills interactions). DOE

**N83-24263#** Los Alamos Scientific Lab., N. Mex.
**BOUNDARY-PERTURBATION FORMALISM FOR POISSON'S EQUATION**
Paul Channell Aug. 1982 7 p
(Contract W-7405-eng-36)
(DE82-021218; LA-9495-MS) Avail: NTIS HC A02/MF A01

A formalism for solving Maxwell's equations in near cylindrical geometries by a boundary perturbation technique is presented. The formalism should be easy to implement numerically. DOE

**N83-24264#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
**ON GENERATING NEW AMICABLE PAIRS FROM GIVEN AMICABLE PAIRS**
Herman J. J. TeRiele Nov. 1982 10 p refs Submitted for publication
(MC-NW-140/82) Avail: NTIS HC A02/MF A01

Rules are given for constructing new amicable pairs from given amicable pairs. By applying these rules to 1575 "mother" pairs known to the author, 1782 new amicable pairs were generated, so that the average "offspring" of these mother pairs is greater than 1. By a second, much more restricted application of the rules to the 400 smallest "daughter" pairs, 88 new "granddaughter" amicable pairs were generated. Author

**N83-24265#** Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
**SPINOR CLASS GROUPS OF ORDERS**
J. Brzezinski 1982 24 p refs
(CTH-Math-1982-22) Avail: NTIS HC A02/MF A01

Let A be a finitely generated separable F-algebra over the field of quotients of a Dedekind ring R. For every R-order lambda in A a group SG(lambda) of spinor genera of R-orders in the genus of lambda is defined and computed in some particular cases. A characterization of Bass R-orders lambda in quaternion F-algebras A and, as a consequence, a description of the group SG(lambda) in the case of Bass orders over the integers are given. M.G.

# 65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

**N83-24266#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Operations Research.
**CONDITIONS FOR EXPONENTIAL ERGODICITY AND BOUNDS FOR THE DECAY PARAMETERS OF A BIRTH-DEATH PROCESS**
E. A. vanDoorn Dec. 1982 63 p refs Submitted for publication
(MC-BW-174/82) Avail: NTIS HC A04/MF A01

Two problems are addressed in connection with expoential ergodicity for birth-death processes on a semi-infinite lattice. The first is to determine from the birth and death rates whether exponential ergodicity prevails. Some necessary and some sufficient conditions are given which suffice to settle the question for most processes encountered in practice. In particular, a complete solution is obtained for processes where, from some finite state n onwards, the associated rates are rational functions of n. The second, more difficult problem is to evaluate the decay parameter of an exponentially ergodic birth-death process. A number of upper and lower bounds are defined. M.G.

**N83-24267#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Mathematical Statistics.
**AN INEQUALITY FOR RANDOM REPLACEMENT SAMPLING PLANS**
W. R. vanZwet Sep. 1982 11 p refs Submitted for publication (MC-SW-87/82) Avail: NTIS HC A02/MF A01

A conjecture of Karlin concerning random replacement sampling plans is discussed. Author

**N83-24268#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Mathematical Statistics.
**RANKS AND ORDER STATISTICS**
W. R. vanZwet Sep. 1982 18 p refs Submitted for publication (MC-SW-88/82) Avail: NTIS HC A02/MF A01

It is shown that under very general conditions, asymptotic normality of a two-sample linear rank statistic under a fixed alternative follows from asymptotic normality of an appropriate linear function of order statistics. M.G.

**N83-24269#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Mathematical Statistics.
**CASE CONTROL STUDIES IN MARKOV CHAIN SETTING**
O. Borgan (Oslo Univ.) and R. D. Gill Oct. 1982 43 p refs Submitted for publication Sponsored by Norwegian Research Council for Science and the Humanities, and Assoc. of Norwegian Insurance Companies
(MC-SW-89/82) Avail: NTIS HC A03/MF A01

For some types of retrospective case-control studies we show how non-parametric estimators of the forces of morbidity for chronic diseases may be constructed. For other types of study, estimators of closely related quantities may be also derived. In each case non-parametric testing can be carried out to investigate whether a certain factor or condition is a risk-factor for the disease. An application is given. Author

**N83-24270#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Mathematical Statistics.
**ON THE BERRY-ESSEEN THEOREM FOR MULTIVARIATE U STATISTICS**
R. Helmers (Limburgs Universitair Centrum, Piepenbeek, Belgium) and P. Janssen Dec. 1982 25 p refs Submitted for publication (Contract EQ-540)
(MC-SW-90/82) Avail: NTIS HC A02/MF A01

A Berry-Esseen bound is established for multivariate U-statistics, the bound uniform w.r.t. wide classes of Borelsets. The result is extended to multivariate L-estimators. Author

**N83-24271#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Mathematical Statistics.
**THE BERRY-ESSEEN BOUND FOR STUDENTIZED U STATISTICS**
R. Helmers Dec. 1982 7 p refs Submitted for publication
(MC-SW-91/82) Avail: NTIS HC A02/MF A01

A Berry-Esseen type bound of order n to the -1/2 for Studentized non degenerate U-statistics of degree two required the finiteness of the 4.5th absolute moment of the kernel h. It is shown that this assumption can be weakened to that of a finite (4+ = epsilon)th absolute moment of the kernel h, for some epsilon greater than 0. Author

**N83-24272#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Mathematical Statistics.
**A LIMITATION OF MARKOV REPRESENTATION FOR STATIONARY PROCESSES**
H. C. P. Berbee and R. C. Bradley (Indiana Univ., Bloomington) Dec. 1982 20 p refs Submitted for publication
(MC-SW-92/82) Avail: NTIS HC A02/MF A01

The existence of a representation of a stationary process as an instantaneous function of a real, irreducible Markov chain imposes important restrictions on the distribution of the process. A countably-valued stationary process with a very strong mixing property for which such a representation does not exist is constructed. M.G.

**N83-24273#** Illinois Univ., Chicago. Dept. of Quantitative Methods.
**TIME-SERIES SEGMENTATION: A MODEL AND A METHOD**
Stanley L. Sclove 31 Dec. 1982 35 p refs Presented at the Workshop of Applied Time Series Analysis, Munich, 22-23 Oct. 1982 Submitted for publication
(Contracts N00014-80-C-0408; DAAG29-82-K-0155; NR Proj. 042-443)
(AD-A123206; TR-82-7; A82-3) Avail: NTIS HC A03/MF A01 CSCL 12/1

The problem of partitioning time-series into segments is treated. The segments are considered as falling into classes. A different probability distribution is associated with each class of segment. Parametric families of distributions are considered, s set of parameter values being associated with each class. With each observation is associated an unobservable label, indicating from which class the observation arose. The label process is modeled as a Markov chain. Segmentation algorithms are obtained by applying a relaxation method to maximize the resulting likelihood function. Special attention is given to the situation in which the observations are conditionally independent, given the labels. A numerical example, segmentation of U.S. Gross National Product, is given. Choice of the number of classes, using statistical model-selection critieria, is illustrated. M.G.

**N83-24274#** Florida State Univ., Tallahassee. Dept. of Statistics.
**MONOTONICITY IN SELECTION PROBLEMS: A UNIFIED APPROACH**
Roger L. Berger and Frank Proschan Sep. 1982 18 p refs
(Contract DAAG29-82-K-0168; Grant AF-AFOSR-0168-82)
(AD-A122942; FSU-STATISTICS-M647; TR-D-57; ARO-19367.2-MA; AFOSR-82-154TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Let X (approximation) = (Xl, ...,Xn) have a density g(x (approximation), lambda (approximation) which is decreasing in transposition, where lambda (approximation) = (lambda l, ..., lambda n). Suppose one wishes to select a subset of (l, ..., n) containing the subscripts associated with the largest values of the lambda i's. Let S(x approximation) be a permutation invariant selection rule which always selects a subset associated with the largest values of the X i (s prine). Author (GRA)

**N83-24275#** Sandia Labs., Albuquerque, N. Mex.
**SOME ASPECTS OF STATISTICAL MODELING OF HUMAN-ERROR PROBABILITY**
R. R. Prairie 1982 12 p refs Presented at the DOE Statistical Symp., Idaho Falls, Idaho, 1 Oct. 1982
(Contract DE-AC04-76DP-00789)
(DE83-001034; SAND-82-2202C; CONF-821021-2) Avail: NTIS HC A02/MF A01

There are several on-going efforts in the US and elsewhere with the purpose of modeling human error such that the human contribution can be incorporated into an overall risk assessment associated with one or more aspects of nuclear power. An effort is described that uses the human reliability analysis (event tree) to quantify and model the human contribution to risk. As an example, risk analyses are prepared on several nuclear power plants as part of the Interim Reliability Assessment Program (IREP). In this process the risk analyst selects the elements of his fault tree that could be contributed to by human error. He then solicits the HF analyst to do a HRA on this element. DOE

# 66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

**N83-24276#** Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
**SPECTRAL ANALYSIS OF STATIONARY STOCHASTIC PROCESSES**

Christian Delhote 1982 58 p refs In FRENCH; ENGLISH summary Report will also be announced as translation (ESA-TT-812)
(ONERA-NT-1982-4; ISSN-0078-3781; ESA-TT-812) Avail: NTIS HC A04/MF A01

Different methods of spectral anlysis are presented emphasizing their high resolution capabilities. On the one hand, standard techniques that use the Fourier transform, allow only a frequency resolution inversely proportional to the time interval. Futhermore, they show cumbersome sidelobes, which can nevertheless be reduced by windowing, but to the detriment of resolution. On the other hand, new methods use the identification theory to design a model from the data involved: the spectrum is therefore derived from the estimated parameters of the model; thus, a better resolution may be expected. The study deals with the calculation of the autoregressive (A.R.) and autoregressive moving average (A.R.M.A.) model parameters, using the least mean squares or the criterion of maximum likelihood. Then, utilization of the model is described in the case of non-stationary processes. Finally, application of the above-mentioned methods to radar signal processing is presented as well as their advantage when tackling short and non-stationary signals. M.G.

**N83-24277#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Operations Research.
**HIERARCHICAL VEHICLE ROUTING PROBLEMS**
A. Marchetti Spaccamela (IASI, Rome), A. H. G. RinnooyKan (Erasmus Univ.), and L. Stougie Aug. 1982 22 p refs
(MC-BW-168/82) Avail: NTIS HC A02/MF A01

Hierarchical vehicle routing problems, in which the decision to acquire a number of vehicles has to be based on imperfect (probabilistic) information about the location of future customers, allow a natural formulation as two-stage stochastic programming problems, where the objective is to minimize the sum of the acquisition cost and the length of the longest route assigned to any vehicle. For several versions of this difficult optimization problem, it is shown that simple heuristics have strong properties of asymptotically optimal behavior. M.G.

**N83-24278#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Operations Research.
**ASYMPTOTIC ANALYSIS OF A QUEUEING SYSTEM WITH A TWO-DIMENSIONAL STATE SPACE**
J. P. C. Blanc Nov. 1982 24 p refs Submitted for publication
(MC-BW-172/82) Avail: NTIS HC A02/MF A01

The asymptotic behavior on the long run of a queueing system with two types of customers, a Poissonian arrival stream, paired services and a general service time distribution is considered. The generating function of time dependent joint queue length distribution is obtained with the aid of the theory of boundary value problems for regular functions and of the theory of conformal mappings of the unit disk onto a given domain. In the asymptotic analysis of this generating function an extensive use is made of theorems on the boundary behavior of conformal mappings. Author

**N83-24279#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Operations Research and System Theory.
**A HIERARCHICAL SCHEDULING PROBLEM WITH A WELL-SOLVABLE SECOND STAGE**
J. B. G. Frenk, A. H. G. RinnooyKan, and L. Stougie Jan. 1983 17 p refs Submitted for publication
(MC-BW-177/83) Avail: NTIS HC A02/MF A01

In the hierarchical scheduling model considered, the decision at the aggregate level to acquire a number of identical machines has to be based on probabilistic information about the jobs that have to be scheduled on these machines at the detailed level. The objective is to minimize the sum of the acquisition costs and the expected average completion time of the jobs. In contrast to previous models of this type, the second part of this objective function corresponds to a well-solvable scheduling problem that can be solved to optimality by a simple priority rule. A heuristic method to solve the entire problem is described, for which strong asymptotic optimality results can be established. M.G.

**N83-24280#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Operations Research.
**TWO OPEN PROBLEMS IN PRECEDENCE CONSTRAINED SCHEDULES**
J. K. Lenstra and A. H. G. RinnooyKan (Erasmus Univ.) Oct. 1982 15 p refs Presented at Conf. surles Ensembles Ordonnees et leur Appl., Lyon, 5-11 Jul. 1982 Submitted for publication
(Grant NSF MCS-78-20054)
(MC-BW-170/82) Avail: NTIS HC A02/MF A01

The computational complexity of a machine scheduling problem can be affected in various ways if a partial order is imposed on the set of jobs that has to be executed. Some typical complexity results for such problems are discussed in the light of two prominent open problems in this area: the minimization of total tardiness for unit-time jobs on a single machine subject to chainlike precedence constraints, and the minimization of maximum completion time for unit-time jobs on three identical parallel machines subject to arbitrary precedence constraints. M.G.

# 67 THEORETICAL MATHEMATICS

Includes topology and number theory.

**N83-24281#** Los Alamos Scientific Lab., N. Mex.
**TWIST MAP, THE EXTENDED FRENKEL-KONTOROVA MODEL AND THE DEVIL'S STAIRCASE**
Serge Aubry 1982 51 p refs Presented at the CNLS Order in Chaos Conf., Los Alamos, N. Mex., 24-28 May 1982
(Contract W-7405-eng-36)
(DE82-021778; LA-UR-82-2351; CONF-8205121-3) Avail: NTIS HC A04/MF A01

Exact results obtained on the discrete Frenkel Kontorova (FK) model and its extensions during the past few years are reviewed. These models are associated with area preserving twist maps of the cylinder (or a part of it) onto itself. The theorems obtained for the FK model thus yield new theorems for the twist maps. The exact structure of the ground-states which are either commensurate or incommensurate are described and the existence of elementary discommensurations under certain necessary and sufficient conditions is asserted. Necessary conditions for the trajectories to represent metastable configurations, which can be chaotic, are given. The existence of a finite Peierl Nabarro barrier for elementary discommensurations is connected with a property of non-integrability of the twist map. The existence of KAM tori corresponds to undefectible incommensurate ground-states and a theorem is given which asserts that when the phenon spectrum of an incommensurate ground-state exhibits a finite gap, then the corresponding trajectory is dense on a Cantor set with zero measure length. Finally, we describe a theorem proving the existence of a devil's staircase for the variation curve of the atomic mean distance versus a chemical potential, for certain properties of the twist map which are generally satisfied. DOE

# 70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

**N83-24282#** Los Alamos Scientific Lab., N. Mex.
**THE 3-BODY FORCES**
J. L. Friar 1982 12 p refs Presented at the Cyclotron Facility Workshop, Bloomington, Ind., 27 Oct. 1982
(Contract W-7405-eng-36)
(DE83-001988; LA-UR-82-3076; CONF-821050-1) Avail: NTIS HC A02/MF A01

Three body forces are defined and their properties discussed. Evidence for such forces in the trinucleon bound states and

scattering reactions is reviewed. The binding energy defects of the trinucleon bound states, the 3He charge density, the Phillips line for doublet n-d scattering lengths, and three nucleon breakup reactions are discussed, together with the possible influence of three body forces on these observables. DOE

**N83-24283#** Fermi National Accelerator Lab., Batavia, Ill.
**DESIGN STUDY OF 50 kG/IN. QUADRUPOLE MAGNET**
Kenji Ishibashi and A. D. McInturff Sep. 1982 20 p refs
(Contract DE-AC02-76CH-03000)
(DE83-000621; FERMILAB/TM-1133) Avail: NTIS HC A02/MF A01

A design study was made on a three-shell quadrupole magnet with an operational field gradient of 2.0 T/cm, which would represent one of the highest values of an accelerator quadrupole. The conductor specifications required the magnet to be cooled by 1.8K, 1 atm superfluid helium. Magnetic and mechanical considerations are described and discussed. DOE

**N83-24284#** Illinois Univ., Urbana. Materials Research Lab.
**LOW-TEMPERATURE THERMAL EXPANSION OF AMORPHOUS SOLIDS Ph.D. Thesis**
David Alan Ackerman 1982 104 p refs
(Contract DE-AC02-76ER-01198)
(DE83-001128; DOE/ER-01198/1390) Avail: NTIS HC A06/MF A01

For most amorphous materials at temperatures below approx. 1 K, the magnitudes and temperature dependences of specific heat, thermal conductivity and ultrasonic dispersion are qualitatively similar, independent of chemical composition. It has been suggested that thermal expansion also exhibits this universal behavior. The development of a dilatometer capable of resolving sample strains as small as 10 to the minus 12th power has permitted measurement of the linear thermal expansion of various glasses below 1 K. These investigations have demonstrated, however, that the low-temperature thermal expansion coefficient of glasses can be positive, negative, large or small. Analysis of measurements performed on two types of vitreous silica, two amorphous polymers, As2S3 and ZrO2:Y2O3 is presented in the context of the phenomenological tunneling-states model. Consistency in explanation of thermal expansion and ultrasonic behavior is maintained by assuming a broad, weakly energy-dependent distribution of coupling strengths between phonons and the localized excitations thought to be characteristic of the glassy state. DOE

**N83-24285#** Academia Sinica, Nankang, Taipei (Taiwan). Inst. of Physics.
**RESEARCH OF THE INSTITUTE OF PHYSICS ACADEMIA SINICA, VOLUME 2 Annual Report**
C. W. Wang, ed. Dec. 1981 126 p refs
(PB83-129098) Avail: NTIS HC A07/MF A01 CSCL 05B

Partial contents: The phase-shifts of alpha 7 Li and alpha 12 C interaction at energies E alpha = 5 and 6 MeV; back surface field and vertical solar cell; infrared spectra of crystalline HF and DF; lattice dynamics of crystalline HF; on the group data and individual data in perception study; dynamic equation for switching in amorphous thin films; a perceptual theory of relativity; and comparison of numerical integration schemes for primitive equation model. GRA

# 71 ACOUSTICS

Includes sound generation, transmission and attenuation. For noise pollution see *45 Environment Pollution.*

**N83-24286** Muenchener Rueckyersicherungs Gesellschaft, Munich (West Germany).
**ULTRA SOUND AND INSURANCE [UEBERSCHALLKNALL UND VERSICHERUNG]**
1976 42 p refs Partly in ENGLISH and GERMAN
Copyright. Avail: Issuing Activity

The supersonic boom and its accompanying phenomena in supersonic flight is discussed. Various questions are raised concerning supersonic air transport: the effects of supersonic boom on humans and their environment; the possibility of keeping the supersonic boom within limits; the operator's responsibility for the damage caused by commercial supersonic aircrafts; the insurability of compensation for damage and claims and its form and conditions. The final decisions are only temporarily, since the experience with the regular utilization of commercial supersonic aircrafts is still not sufficient and the creation of international liability agreements are still in the planning stage. Transl. by E.A.K.

**N83-24287*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
**A PRELIMINARY COMPARISON BETWEEN THE SR-6 PROPELLER NOISE IN FLIGHT AND IN A WIND TUNNEL**
James H. Dittmar, Paul L. Lasagna, and Karen G. Mackall 1983 18 p refs Presented at the 105th Meeting of the Acoustical Soc. of Am., Cincinnati, 9-13 May 1983
(NASA-TM-83341; E-1596; NAS 1.15:83341) Avail: NTIS HC A02/MF A01 CSCL 20A

High speed turboprops offer an attractive candidate for aircraft because of their high propulsive efficiency. However, one of the possible problems associated with these propellers is their high noise level at cruise condition that may create a cabin environment problem. Models of these propellers were tested for acoustics in the 8 by 6-foot wind tunnel and on the Jet Star airplane. Comparisons between the airplane and wind tunnel data for the SR-6 propeller are shown. The comparison of maximum blade passing tone variation with helical tip Mach number between the tunnel and flight data was good when corrected to the same test conditions. Directivity comparisons also showed fairly good agreement. These good comparisons indicate that the wind tunnel is a viable location for measuring the blade passage tone noise of these propellers. S.L.

**N83-24288#** Technische Univ., Aachen (West Germany). Inst. fuer Dampf- und Gasturbinen.
**MEASUREMENTS OF THE VELOCITY OF SOUND ON THE SATURATION LINE, AT THE CRITICAL POINT AND IN THE TWO-PHASE AREA Final Report, May 1982**
Raimund Croonenbrock Bonn Bundesministerium fuer Forschung und Technologie Dec. 1982 47 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-234; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 10

Measurements of the velocity of sound along the saturation line up to conditions only 0,2 K below the critical point were performed by ultrasonic interferometry. The values of the velocity of sound and of the isentropic exponent calculated from the measurements serve as verification or initiate improvement of the existing equation of state for steam. In the region around the critical point being of great importance for some applications there are great deviations between the measurement and the values, determined by the equation of state. They are caused by inadequacies of the mathematical formulation. For measurements in the two-phase area an ultrasonic interferometer with variable sound path length is described. A lot of measurements were taken along several isobars with different droplet size distributions. The data are presented and discussed. S.L.

**N83-24289#** Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
**FAR-FIELD ACOUSTIC DATA FOR THE TEXAS ASE, INC. HUSH-HOUSE, SUPPLEMENT**
Robert A. Lee Apr. 1982 288 p
(AF Proj. 7231)
(AD-A122844; AFAMRL-TR-81-148-Suppl) Avail: NTIS HC A13/MF A01 CSCL 06/6

This report supplements AFAMRL-TR-73-110, which describes the data base (NOISEFILE) used in the computer program (NOISEMAP) to predict the community noise exposure resulting

from military aircraft operations. The results of field test measurements to define the single-event noise produced on the ground by military aircraft/engines operating in the Texas ASE Inc. hush-house are presented as a function of angle (0 to 180 from the front of the hush-house) and distance (200 ft to 2500 ft) in various acoustic metrics. GRA

**N83-24290#** Massachusetts Inst. of Tech., Cambridge. Lab. for Fluid Dynamics Research.
**PREDICTIONS OF LOW-FREQUENCY SOUND FROM THE MOD-1 WIND TURBINE**
R. Martinez, S. E. Windall, and W. L. Harris Dec. 1982 61 p refs
(Contract DE-AC02-77CH-00178)
(DE83-004410; SERI/TR-635-1247) Avail: NTIS HC A04/MF A01

The purpose was to determine if aerodynamic noise mechanisms are associated with the acoustic noise situation that results from the operation of the MOD-1 wind turbine near Boone, NC. Acoustic measurements indicate that sound from the turbine produced structural vibrations in homes near the turbine site. The possible sources of aeroacoustic noise studied were steady blade loads, unsteady blade loads due to wind shear, and unsteady loads on the blades as they pass through the tower wake. Mathematical models that were used to study these noise sources are described. The results showed that the most significant source of impulsive, low-frequency sound was the unsteady loads that occurred when the blade passed through the tower wake. This problem might be resolved by operating the turbine at a lower rotor speed. This issue might also be resolved by changing the structural configuration of the tower to create an azimuthally smoother wake which would dramatically reduce the noise. DOE

# 72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

**N83-24291#** Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
**CONVERGENCE OF A FULLY DISCRETE SCHEME FOR A TWO-DIMENSIONAL NEUTRON TRANSPORT**
Claes Johnson and Juhani Pitkaeranta (Helsinki Univ. of Technology, Espoo, Finland) 1982 28 p refs
(CTH-Math-1982-16) Avail: NTIS HC A03/MF A01

An error estimate was proved for a fully discrete method for the numerical solution of a two dimensional model problem in neutron transport theory based on using the discrete ordinates method for the angular variable and the discontinuous Galerkin finite element method with piecewise linear trial functions fo the space variable. Author

**N83-24292#** Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
**GAUSS VII: A COMPUTER PROGRAM FOR THE ANALYSIS OF (BETA)-RAY SPECTRA FROM Ge SEMICONDUCTOR SPECTROMETERS**
C. M. McCullagh and R. G. Helmer Oct. 1982 122 p refs
(Contract DE-AC07-76ID-01570)
(DE83-003721; EGG-PHYS-5890) Avail: NTIS HC A06/MF A01

A description is given of a computer program, GAUSS VII, which was written to determine BETA-ray spectra from Ge semiconductor spectrometers. The preliminary portions of the program can determine the energy and width calibration equations, locate individual peaks and define peak regions that are significiently above the local spectral background. The user may edit these lists of peaks and regions. Each peak region is fitted with one or more components in which the peaks are represented by a Gaussian function or a Gaussian with one or two additive exponential tails on the low-energy side and one on the high-energy side. A step-like background function can be used with each component. The program will automatically recycle to add one or more components to a region if needed to improve the fit. The BETA ray energies and intensities are computed from resulting Gaussian positions and peak areas. To allow the user to determine the best results, the results from the analyses for each region with different numbers of components can be printed and line-printer plots of the fits to the data can be made. The quality of the results depends primarily on the ability of the program to define a good spectral region for each analysis and the ability to recycle to determine the proper number of components. DOE

**N83-24293#** North Carolina Univ., Chapel Hill. Dept. of Physics and Astronomy.
**THEORY OF COULOMB EXCITATION AND IONIZATION**
Eugen Merzbacher 1982 30 p refs Presented at the NATO Advan. Study Inst. on Fundamental Processes in Energetic Atomic Collisions, Maratea, Italy, 20 Sep. - 1 Oct. 1982
(Contract DE-AS05-76ER-02408)
(DE83-004562; DOE/ER-02408/213) Avail: NTIS HC A03/MF A01

The theoretical description of atomic Coulomb excitation and ionization is examined. It is discussed in the context of the general theory of atomic collisions. DOE

**N83-24294#** Monsanto Research Corp., Miamisburg, Ohio.
**SEPARATION OF SELECTED STABLE ISOTOPES BY LIQUID-PHASE THERMAL DIFFUSION AND BY CHEMICAL EXCHANGE**
W. M. Rutherford, B. E. Jepson, and E. D. Michaels 1982 20 p refs Presented at the ACS Natl. Meeting, Kansas City, Mo., 12-17 Sep. 1982
(Contract DE-AC04-76DP-00053)
(DE82-021348; MLM-2992-OP; CONF-820909-9) Avail: NTIS HC A02/MF A01

Useful applications of enriched stable nuclides are unduly restricted by high cost and limited availability. Recent research on liquid phase thermal diffusion (LTD) has resulted in practical processes for separating S34, CL35, and CL37 in significant quantities (100 to 500 g/yr) at costs much lower than those associated with the electromagnetic (Calutron) process. The separation of the isotopes of bromine by LTD is now in progress and BR79 is being produced in relatively simple equivalent at a rate on the order of 0.5 g/day. The results of recent measurements show that the isotopes of Zn can be separated by LTD of zinc alkyls. The isotopes of calcium can be separated by LTD and by chemical exchange. The LTD process is based on the use of aqueous Ca(NO3)2 as a working fluid. DOE

**N83-24295#** Oak Ridge National Lab., Tenn. Chemical Physics Section.
**MULTIPHOTON IONIZATION AND 3RD-HARMONIC GENERATION IN ATOMS AND MOLECULES**
John C. Miller and R. N. Compton 1982 9 p refs Presented at the NATO Conf. on Photophys. and Photochem. in the Vacuum Ultraviolet, Lake Geneva, Wisc., 15 Aug. 1982
(Contract W-7405-eng-26)
(DE82-020822; CONF-820853-2) Avail: NTIS HC A02/MF A01

Recent experiments on multiphoton ionization and third-harmonic generation in rare gases and small molecules using focused laser power densities of 10 to the 9th power to 10 to the 11th power W/sq cm are discussed. Also, some elementary experiments using vacuum ultraviolet light generated by frequency tripling in xenon and krypton will be described. These experiments include absorption and ionization studies using vacuum ultraviolet radiation as well as two-photon ionization using one vacuum ultraviolet photon and one laser photon. DOE

**N83-24296#** California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
**RELATIVISTIC CALCULATIONS OF DISSOCIATION ENERGIES AND RELATED PROPERTIES**
Kenneth S. Pitzer Jul. 1982 33 p refs Presented at the Symp. on Relativistic Effects in Quantum Chem., Abo Akademi, Finland, 21-23 Jun. 1982

(Contract DE-AC03-76SF-00098)
(DE82-020541; LBL-14705; CONF-8206111-1) Avail: NTIS HC A03/MF A01

Methods of calculation of potential energy curves of surfaces, including dissociation energies, bond distances, and vibration frequencies, are discussed as well as recently obtained results for several molecules. The ad initio relativistic methods involve the derivation of shape-consistent effective potentials from Dirac-Fock atomic calculations. These effective potentials are averaged and differenced with respect to spin with the differences, p/sub 3/2/ - p/sub 1/2, etc., yieldng sin-orbit operators. The molecular calculations are then set up in a familiar manner through the SCF stage using spin-averaged effective potentials. The final stage is a configuration interaction calculation including the sin-orbit terms as well as the electron repulsion terms. Calculations which have been made for several low-lying excited states as well as the ground state for Au2, TlH, Tl2,Sn2, and Pb2 are reviewed. Good agreement is obtained with spectroscopic data and a number of interesting predictions are made. DOE

**N83-24297#** California Univ., Berkeley. Lawrence Berkeley Lab. Dept. of Chemistry.
**NON-RIGID MOLECULAR GROUP THEORY AND ITS APPLICATIONS**
K. Balasubramanian Jun. 1982 20 p refs Presented at the Conf. on Symmetries and Properties of Non-Rigid Molecules, Paris, 30 Jun. - 8 Jul. 1982
(Contract DE-AC03-76SF-00098)
(DE82-020518; LBL-14598; CONF-8206112-1) Avail: NTIS HC A02/MF A01

The use of generalized wreath product groups as representations of symmetry groups of nonrigid molecules is considered. Generating function techniques are outlined for nuclear spin statistics and character tables of the symmetry groups of nonrigid molecules. Several applications of nonrigid molecular group theory to NMR spectroscopy, rovibronic splitting and nuclear spin statistics of nonrigid molecules, molecular beam defection and electric resonance experiments of weakly bound Van der Waal complexes, isomerization processes, configuration interaction calculations and the symmetry of crystals with structural distortions are described. DOE

**N83-24298#** Oak Ridge National Lab., Tenn.
**ADVANCED DESIGN OF POSITIVE-ION SOURCES FOR NEUTRAL-BEAM APPLICATIONS**
E. F. Marguerat, H. H. Haselton, M. M. Menon, D. E. Schechter, W. L. Stirling, and C. C. Tsai 1982 4 p refs Presented at the 9th Symp. on Eng. Probl. of Fusion Res., Chicago, 16 Oct. 1982
(Contract W-7405-eng-26)
(DE83-001884; CONF-821016-3) Avail: NTIS HC A02/MF A01

In a continuing effort to advance the state of the art and to produce long pulse ion beams, APIS ion sources with grid dimensions of 10 x 25 cm, 13 x 43 cm, and 16 x 48 cm are being developed. In the past year, the 10- x 25-cm ion source were operated to produce ion beams in excess of 100 keV for many seconds pulse length. An advanced design concept is being pursued with the primary objectives to improve radiation protection, reduce fabrication costs, and simplify maintenance. The source magnetic shield is to be designed as a vacuum enclosure to house all source components. The electrical insulation requirements of energy recovery are also considered. Because of the frequent maintenance requirements, a remote handling capability is provided for the electron emitter. An accelerator design which incorporates the necessary neutron shielding and associated steering gimbal system is also described. DOE

**N83-24299#** Sandia Labs., Albuquerque, N. Mex.
**ELECTRON-AND PHOTON-STIMULATED DESORPTION**
M. L. Knotek 1982 15 p refs Presented at the Intern. Conf. on X-Ray and Atomic Innershell Phys., Eugene, Oreg., 23 Aug. 1982
(Contract DE-AC04-76DP-00789)
(DE83-001285; SAND-82-2299C; CONF-820855-5) Avail: NTIS HC A02/MF A01

In one sense, stimulated desorption can serve as an electronic and structural probe specific to the desorbed species and its surface bonding environment. This arises from knowledge of the excitation processes which initiate desorption, and the intrinsic electronic properties of the surface which govern desorption processes. Alternatively the desorption experiment can provide insight into the dynamics of charge motion in the surface bond. The desorption process is a complex interplay between electronic and nuclear motions which occur in response to the highly energetic and localized electronic excitations which are known to induce desorption. The mechanisms of desorption, desorption modeling in covalent systems, and desorption spectroscopy are discussed. DOE

**N83-24300#** Saint Bonaventure Univ., N.Y.
**PION-NUCLEON PARTIAL-WAVE ANALYSIS AND STUDY OF BARYON STRUCTURE Final Report, 1 Jun. 1981 - 31 Aug. 1982**
31 Aug. 1982 5 p refs
(Contract DE-AC02-79ER-10402)
(DE83-000724; DOE/ER-10402/2) Avail: NTIS HC A02/MF A01

This report outlines the progress made in the past 15 months toward completion of a long-term pion-nucleon partial wave analysis in collaboration with R.E. Cuthosky at Carnegie-Mellon University. The report details other theoretical work done during this time period, including work on the Table of Particle Properties, 1982. DOE

**N83-24301#** Virginia Univ., Charlottesville. Dept. of Physics.
**EXPERIMENTS ON THE NUCLEAR INTERACTIONS OF PIONS Progress Report**
R. C. Minehart and K. O. H. Ziock Aug. 1982 35 p
(Contracts DE-AS05-76ER-04043; EY-76-S-05-54043)
(DE83-000112; DOE/ER-0043/42; ORO-4043-42) Avail: NTIS HC A03/MF A01

Progress is reported on the following projects: (1) quasi-free scattering of pions from He-3 and He-4 at 200 and 295 MeV; (2) elastic and quasi-free scattering of (pion/sup +-/ from He-3 and He-4 at energies above the 3-3 resonance; (3) positive pion + D yields 2p; (4) pion double charge exchange; (5) He-3, 4 (negative pion,n) He-2, 3 and He-4 (negative pion, neutral pion) He-3 at 285-575 MeV; (6) search for massive neutrinos as an admixture to negative pion muon decay; (7) quasi-free pion scattering; (8) measurement of the negative pion-neutral pion mass difference; and (9) search for fractionally charged particles. DOE

**N83-24302#** Los Alamos Scientific Lab., N. Mex.
**AN AUTOMATED ACTIVATION ANALYSIS SYSTEM**
M. M. Minor, S. R. Garcia, and R. R. Denton 1982 11 p refs Presented at the 4th Symp. on Nucl. Chem., Radiochem. and Radiation Chem., Mexico City, 7-10 Sep. 1982
(Contract W-7405-eng-36)
(DE82-000330; LA-UR-82-2590; CONF-820958-1) Avail: NTIS HC A02/MF a01

An automated delayed neutron counting and instrumental neutron activation analysis system was developed at Los Alamos National Laboratory's Omega West Reactor. The system was used to analyze samples for uranium and 31 additional elements with a maximum throughput of 400 samples per day. DOE

**N83-24303#** California Univ., Livermore. Lawrence Livermore Lab.
**ADVANCED TEST ACCELERATOR: A HIGH-CURRENT INDUCTION LINE**
E. G. Cook, D. L. Birx, and L. L. Reginato 1 Nov. 1982 17 p refs Presented at the Conf. on Appl. of Accelerator in Res. and Ind., Denton, Texas, 10 Nov. 1982
(Contract W-7405-eng-48)
(DE83-002150; UCRL-88312; CONF-821123-1) Avail: NTIS HC A02/MF A01

The Advanced Test Accelerator (ATA) is a linear induction accelerator being built at Lawrence Livermore National Laboratory. The aim of the ATA, together with its associated physics program

is the research and development necessary to resolve whether particle-beam propagation is possible. Since the accelerator is the tool needed to do the basic propagation experiment, many of its design parameters are specified by the physics. The accelerator parameters are: 50 MeV, 10 kA, 70 ns pulse width (FWHM), and a 1 kHz rep-rate during a ten-pulse burst. In addition, beam quality and pulse-to-pulse repeatability must be excellent. The unique features of the accelerator are the 10 kA beam and the 1 kHz burst frequency. DOE

**N83-24304#** Los Alamos Scientific Lab., N. Mex.
**PHYSICS WITH A HIGH-INTENSITY PROTON ACCELERATOR BELOW 30 GeV**
Cyrus M. Hoffman 1982 7 p refs Presented at the Am. Phys. Soc. Summer Study on Particle Phys. and Future Facilities, Snowmass, Colo., 1 Jul. 1982
(Contract W-7405-eng-36)
(DE83-000614; LA-UR-82-2768; CONF-820750-2) Avail: NTIS HC A02/MF A01

The increased intensity of synchrotrons would benefit the study of neutrino interactions and provide the kaon and muon beams necessary to study and examine rare decay modes and measure charge parity violation. Other possible uses include QCD tests and particle spectroscopy including the search for glueballs. Such facilities would also provide appropriate situations for training graduate students and allow for the incorporation of new ideas into experiments. A.R.H.

**N83-24305#** California Univ., Berkeley. Lawrence Berkeley Lab. Nuclear Science Div.
**TWO-PION CORRELATIONS IN HEAVY ION COLLISIONS Ph.D. Thesis**
William Allen Zajc Aug. 1982 170 p refs
(Contract DE-AC03-76SF-00098)
(DE83-000519; LBL-14864) Avail: NTIS HC A08/MF A01

An application of intensity interferometry to relativistic heavy ion collisions is reported. Source sizes are obtained that are consistent with a simple geometric interpretation. Lifetimes are less well determined but are indicative of a faster pion production process than predicted by Monte Carlo cascade calculations. There appears to be a substantial coherent component of the pion source, although measurement is complicated by the presence of final state interactions. Additionally, the generation of spectra of uncorrelated events is discussed. In particular, the influence of the correlation function on the background spectrum is analyzed, and a prescription for removal of this influence is given. A formulation to describe the statistical errors in the background is also presented. Finally, drawing from the available literature, a self contained introduction to Bose-Einstein correlations and the Hanbury-Brown - Twiss effect is provided, with an emphasis on points of contact between classical and quantum mechanical descriptions. DOE

**N83-24306#** California Univ., Livermore. Lawrence Livermore Lab.
**EFFECT OF RESONANCE STRUCTURE ON 14-MeV MONTE CARLO NEUTRON TRANSPORT IN NITROGEN AND AIR**
E. F. Plechaty 20 Oct. 1982 9 p refs
(Contract W-7405-eng-48)
(DE83-001729; UCID-19583) Avail: NTIS HC A02/MF A01

The results of Monte Carlo calculations can be sensitive to methods used to treat cross sections. This sensitivity can be emphasized by studying one isotope of an element or material that has a resonance region. Very few naturally occurring materials exist in a mono-isotopic form, but when such a material is an important part of a problem, care should be exercised in the selection of a code to be used for the calculations. It is recommmended that the ALICE code, that uses a multiband treatment for cross sections, be used at LLNL for neutronic and neutron-induced photonic problems. DOE

**N83-24307#** California Univ., Berkeley. Lawrence Berkeley Lab.
**STATISTICS AT WORK IN HEAVY-ION REACTIONS**
Luciano G. Moretto Jul. 1982 135 p refs Presented at the Enrico Fermi Intern. School of Phys. on Nucl. Struct. and Heavy Ion Dyn., Varenna, Italy, 27 Jul. - 6 Aug. 1982
(Contract DE-AC03-76SF-00098)
(DE82-020337; LBL-14563; CONF-820746-1) Avail: NTIS HC A07/MF A01

In the first part special aspects of the compound nucleus decay are considered. The evaporation of particles intermediate between nucleons and fission fragments is explored both theoretically and experimentally. The limitations of the fission decay width expression obtained with the transition state method are discussed, and a more general approach is proposed. In the second part the process of angular momentum transfer in deep inelastic reactions is considered. The limit of statistical equilibrium is studied and specifically applied to the estimation of the degree of alignment of the fragment spins. The magnitude and alignment of the transferred angular momentum is experimentally determined from sequentially emitted alpha, gamma, and fission fragments. DOE

**N83-24308#** Oak Ridge National Lab., Tenn.
**NEUTRON-SCATTERING STUDIES OF THE HIGH-TEMPERATURE SPIN DYNAMICS OF FERROMAGNETIC MATERIALS**
H. A. Mook Jul. 1982 15 p refs Presented at the IUPAP Intern. Conf. on Magnetism, Kyoto, Japan, 6 Sep. 1982
(Contract W-7405-eng-26)
(DE82-022297; CONF-820929-6) Avail: NTIS HC A02/MF A01

The two approaches to understanding the magnetic properties of materials are the localized Heisenberg model and the band theory of electrons. Neutron scattering results at elevated temperatures will be discussed in terms of these models for EuO, Gd, and Ni. It is found that measurements near and above the Curie temperature T/sub c/ are particularly useful for distinguishing between models for ferromagnetism in these materials. DOE

**N83-24309#** Oak Ridge National Lab., Tenn. Engineering Physics Div.
**ELECTRON SPECTRA FROM DECAY OF FISSION PRODUCTS**
J. K. Dickens Sep. 1982 97 p refs
(Contract W-7405-eng-26)
(DE82-021114; ORNL/TM-8285) Avail: NTIS HC A05/MF A01

Electron spectra following decay of individual fission products are obtained from the nuclear data given in the compilation using a listed and documented computer subroutine. Data are given for more than 500 radionuclides created during or after fission. The data include transition energies, absolute intensities, and shape parameters when known. An average beta-ray energy is given for fission products lacking experimental information on transition energies and intensities. For fission products having partial or incomplete decay information, the available data are utilized to provide test estimates of otherwise unknown decay schemes. This compilation is completely referenced and includes data available in the reviewed literature up to January 1982. DOE

**N83-24310#** Temple Univ., Philadelphia, Pa. Dept. of Physics.
**EXPERIMENTAL INVESTIGATIONS IN PARTICLE PHYSICS AT INTERMEDIATE ENERGIES**
L. B. Auerbach and V. L. Highland Aug. 1982 12 p refs
(Contract DE-AC02-76ER-03539)
(DE82-021049; DOE/ER-03539/20; COO-3539-20) Avail: NTIS HC A02/MF A01

The analysis of the pion-beta decay experiment is complete with an improvement in accuracy of a factor of two over previous work. Preparations for the search for bound states in anti pp at CERN using the LEAR facility are well advanced. The proposal to use the Crystal Box at LAMPF for a new pi-zero-to-three-gamma experiment has been approved. Work on the neutrino experiment proposal (No. 638) at LAMPF has continued. We expect to make some contributions to the proposal for LAMPF II in the coming months. DOE

**N83-24311#** California Univ., Livermore. Lawrence Livermore Lab.

**A THEORY OF BENDING WAVES WITH APPLICATIONS TO DISK GALAXIES**
James W.-K. Mark 1982 30 p refs Presented at the UBC-UM Conf. on the Milky-Way, Vancouver, Canada, 17-19 May 1982 Submitted for publication
(Contract W-7405-eng-48)
(DE82-019063; UCRL-87815; CONF-8205108-1) Avail: NTIS HC A03/MF A01

A theory of bending waves is surveyed which provides an explanation for the required amplification of the warp in the Milky Way. It also provides for self-generated warps in isolated external galaxies. The shape of observed warps and partly their existence in isolated galaxies are indicative of substantial spheroidal components. The theory also provides a plausible explanation for the bending of the inner disk (< 2 kpc) of the Milky Way. DOE

**N83-24312#** California Univ., Berkeley. Lawrence Berkeley Lab.
**HEAVY CHARGED-PARTICLE BEAM DISOMETRY**
John T. Lyman Jun. 1982 21 p refs Presented at the IAEA Meeting on Advan. in Dosimetry for Fast Neutrons and Heavy Charged-Particles for Therapy Appl., Vienna, 14-18 Jun. 1982
(Contract DE-AC03-76SF-00098)
(DE82-020315; LBL-14779; CONF-8206113-1) Avail: NTIS HC A02/MF A01

A computational description of the physical properties and the beam composition of a heavy charged-particle beam is presented. The results obtained with this beam model were compared with numerous sets of experimental data and it appears to provide an adequate representation of the major features of a heavy charged-particle beam. Knowledge of the beam composition aids in the identification regions of the beam where special dosimetry problems may be encountered. DOE

**N83-24313#** Oak Ridge National Lab., Tenn. Health and Safety Research Div.
**COMPARISON OF ELECTRON-TRANSPORT CALCULATIONS FOR WATER IN THE LIQUID AND VAPOR PHASES**
J. E. Turner, H. G. Paretzke (Gesellschaft fuer Strahlen-und Umweltforschung), R. N. Hamm, H. A. Wright, and R. H. Ritchie 1982 16 p refs Presented at the 8th Symp. on Microdosimetry, Julich, West Germany, 27 Sep. 1982
(Contract W-7405-eng-26)
(DE82-022288; CONF-820931-7) Avail: NTIS HC A02/MF A01

Information on electron track structure in liquid water is a prerequisite for understanding many radiation effects. Since most available data exist for the vapor and few exist for the liquid, it is essential to understand how differences in the state of condensation affect energy-loss phenomena. Results of two independent electron transport codes for water in the gaseous and liquid phases are compared. Although several essential phase-dependent differences occur in the cross sections used as input data in the two codes, spatial energy deposition and total mass stopping power are found not to depend critically on the phase. The respective yields of ionization and excitations produced during energy deposition can, however, differ markedly between the liquid and gaseous states. DOE

**N83-24314#** Oak Ridge National Lab., Tenn. Health and Safety Research Div.
**PHYSICAL AND CHEMICAL EVOLUTION OF AN ELECTRON TRACK IN LIQUID WATER**
H. A. Wright, J. E. Turner, R. N. Hamm, R. H. Ritchie, J. L. Magee (California Univ., Berkeley. Lawrence Berkeley Lab.), and A. Chatterjee (California Univ., Berkeley. Lawrence Berkeley Lab.) 1982 10 p refs Presented at the 8th Symp. on Microdosimetry, Julich, West Germany, 27 Sep. 1982
(Contract W-7405-eng-26)
(DE82-022287; CONF-820931-6) Avail: NTIS HC A02/MF A01

A model to determine the position and identity of each species about the track of an electron in liquid water at any time from the passage of the primary electron (which occurs in aprox. 10 to the-15 power s) to times of the order of a microsecond at which chemical evolution of the track is essentialy complete is presented. DOE

# 73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation.*

**N83-24315#** Pacific Northwest Lab., Richland, Wash.
**WASTE MIXES STUDY FOR SPACE DISPOSAL**
R. F. McCallum, H. T. Blair, R. W. McKee, D. J. Silviera, and J. L. Swanson Jan. 1983 212 p refs
(Contract DE-AC06-76RL-01830)
(ONWI-422) Avail: NTIS HC A10/MF A01

Space disposal for certain high level (HLW) and transuranic wastes (TRU) are studied to determine if removal of radionuclides from HLW and TRU significantly reduces the long term radiological risks of geologic disposal, to determine if chemical partitioning of the waste for space disposal is technically feasible, to identify acceptable waste forms for space disposal, and to compare improvements in geologic disposal system performace to impacts of additional treatment, storage and transportation necessary for space disposal. It is concluded that the incentive for space disposal is that it offers a perception of reduced risks rather than significant reduction. Suitable waste forms for space disposal are cermet for HLW, metallic technetium, and lead iodide. Space disposal of HLW appears to offer insignificant safety enhancements when compared to geologic disposal; the disposal of iodine and technetium wastes in space does not offer risk advantages. Increases in short-term doses for the alternatives are minimal; however, incremental costs of treating, storing and transporting wastes for space disposal are substantial. S.L.

**N83-24316#** Ruhrkohle Oel und Gas G.m.b.H., Bottrop (West Germany).
**PROTOTYPE PANT FOR NUCLEAR PROCESS HEAT (PNP). VERIFICATION OF RUHRKOHLE'S AG'S INTERESTS Final Report, Mar. 1982**
Rainer Duernfeld and Guenter Kraut-Giesen Bonn Bundesministerium fuer Forschung und Technologie Nov. 1982 40 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-213; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 8,50

The realization of nuclear coal gasification with a nuclear high tempeature reactor (HTR) in accordance with the technical status as well as meeting the existing safety regulations seems to be feasible. Research and development is needed for affirmation of design. The gasification of hard coal basing on the autothermal principal is possible. The design work for the pilot plant should be started immediately, particularly keeping in mind the decision for erection of PNP in 1990. The calculation of production costs in comparison to autothermal gasification processes is promising better economics, if uncertainties of investment calculation are deemed to be neglectable. S.L.

**N83-24317#** Los Alamos Scientific Lab., N. Mex.
**SHIELDING CONSIDERATIONS FOR ADVANCED SPACE NUCLEAR REACTOR SYSTEMS**
Joseph P. Angelo, Jr. (Florida Inst. of Tech.) and David Buden 1982 19 p refs Presented at the IEEE Conf. on Nucl. and Space Radiation Effects, Las Vegas, Nev., 20-12 Jul. 1982
(Contract W-7405-eng-36)
(DE82-019565; LA-UR-82-2002; CONF-820708-8) Avail: NTIS HC A02/MF A01

To meet the anticipated future space power needs, the Los Alamos National Laboratory is developing components for a compact, 100 kW/sub e/-class heat pipe nuclear reactor. The

reactor uses uranium dioxide (UO2) as its fuel, and is designed to operate around 1500 k. Heat pipes are used to remove thermal energy from the core without the use of pumps or compressors. The reactor heat pipes transfer mal energy to thermoelectric conversion elements that are advanced versions of the converters used on the enormously successful Voyager missions to the outer planets. Advanced versions of this heat pipe reactor could also be used to provide megawatt-level power plants. The status of this advanced heat pipe reactor is reviewed and the radiation environments and shielding requirements for representative manned and unmanned applications are explored. DOE

**N83-24318#** Oak Ridge National Lab., Tenn. Health and Safety Research Div.

**PROCEEDINGS OF THE SYMPOSIUM ON UNCERTAINTIES ASSOCIATED WITH THE REGULATION OF THE GEOLOGIC DISPOSAL OF HIGH-LEVEL RADIOACTIVE WASTE**

David C. Kocher, ed. Mar. 1982 493 p refs Symp. held at Gatlinburg, Tenn., 9-13 Mar. 1981 Sponsored in part by the Nuclear Regulatory Commission

(Contract W-7405-eng-26)

(DE82-008883; NUREG/CP-0022; CONF-810372) Avail: NTIS HC A21/MF A01

Technical aspects related to the development of standards for regulating geologic disposal of high level radioactive waste, with particular emphasis on the sources and magnitudes of uncertainties associated with methods for predicting post closure repository performance and potential health risks to future generations are discussed. Important licensing and regulatory issues involved in geologic waste disposal, and the social and political climate in which issues of high level waste management are being debated are also considered. DOE

**N83-24319#** Du Pont de Nemours (E. I.) and Co., Aiken, S.C.

**DEVELOPMENT, EVALUATION, AND SELECTION OF CANDIDATE HIGH-LEVEL WASTE FORMS**

Thomas A. Bernadzikowski, Jeffrey S. Allender, Donald E. Gordon, and Thomas H. Gould, Jr. 1982 45 p refs Submitted for publication

(Contract DE-AC09-76SR-00001)

(DE82-020155; DP-MS-82-47) Avail: NTIS HC A03/MF A01

The seven candidate waste forms, evaluated as potential media for the immobilization and gelogic disposal of high level nuclear wastes were boroslicate glass, SYNROC, tailored ceramic, high silica glass, FUETAP concrete, coated sol-gel particles, and glass marbles in a lead matrix. The evaluation, combined preliminary waste form evaluations, peer review assessments, a product performance evaluation, and a processability analysis. Based on the combined results of these four inputs, two of the seven forms, borosilicate glass and a titanate-based ceramic, SYNROC, were selected as the reference and alternative forms, respectively, for continued development and evaluation in the National HLW Program. The borosilicate glass and ceramic forms were further compared on the basis of risk assessments, cost comparisons, properties comparisons, and conformance with proposed regulatory and repository criteria. DOE

**N83-24320#** Du Pont de Nemours (E. I.) and Co., Aiken, S.C.

**RESEARCH PRIORITIES FOR ISOLATION OF DEFENSE HIGH-LEVEL AND TRANSURANIC WASTES IN THE UNITED STATES**

Donald E. Gordon 1982 24 p refs Presented at the 5th Intern. Symp. on the Sci. Basis for Radioact. Waste Management, Berlin, 7-10 Jun. 1982

(Contract DE-AC09-76SR-00001)

(DE82-019159; DP-MS-81-127; CONF-820636-7) Avail: NTIS HC A02/MF A01

Several research priorities relating to the isolation of HLW and TRU waste were identified. For HLW, the research needs center around the improvement of waste immobilization technology, a better understanding of leaching mechanisms and the interactions among waste system variables, and establishment of risk assessments as the technical bases for regulatory criteria. For TRU waste, additional work on classification techniques and methods to immobilize particulates is suggested. DOE

**N83-24321#** Du Pont de Nemours (E. I.) and Co., Aiken, S.C. Planning Sect.

**ASSESSMENT OF HIGH-LEVEL WASTE FORM CONFORMANCE WITH PROPOSED REGULATORY AND REPOSITORY CRITERIA**

Donald E. Gordon, Peter L. Gray, Alfred S. Jennings, and Philip H. Permar Apr. 1982 37 p refs

(Contract DE-AC09-76SR-00001)

(DE82-105753; DPST-82-410) Avail: NTIS HC A03/MF A01

Federal regulatory criteria for geologic disposal of high level waste are under development. Also, interim performance specifications for high level waste forms in geologic isolation are being developed within the Federal program responsible for repository selection and operation. Two high level waste forms, borosilicate glass and crystalline ceramic, were selected as candidate immobilization forms for the Defense Waste Processing Facility which is to immobilize high level wastes. An assessment of how these two waste forms conform with the proposed regulatory criteria and repository specifications was performed. Both forms were determined to be in conformance with postulated rules for radionuclide releases and radiation exposures throughout the entire waste disposal system, as well as with proposed repository operation requirements. DOE

**N83-24322#** Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.

**IMMOBILIZATION OF TRANSURANIC SLUDGE IN GLASS-CERAMIC MATERIALS**

J. M. Welch, R. P. Schuman, and J. E. Flinn Mar. 1982 42 p refs

(Contract DE-AC07-76ID-01570)

(DE82-015621; EGG-FM-5709) Avail: NTIS HC A03/MF A01

The effectiveness of glass ceramic waste forms, particularly iron enriched basalt, for immobilizing transuranic waste sludges were determined. Two sludges were used in the study - one was nonradioactive and the other contained approximately 2200 dps/mg of Am-241. The glass ceramic waste forms were produced from laboratory scale melting operations with subsequent controlled cooling. The waste forms were examined to assess the microstructures which resulted from systematically varied compositions and controlled cooling sequences. Leach tests in deionized water were performed on small monolithic specimens of the various glass ceramic materials. The test results showed a rather strong temperature dependence for leach rates. Also, for some of these materials, marked differences in the Am-241 leaching behavior were seen in measurements obtained on acidified versus neutral aliquots of the spent leachates. DOE

**N83-24323#** Battelle Pacific Northwest Labs., Richland, Wash.

**SPENT FUEL BEHAVIOR IN DRY STORAGE**

A. B. Johnson, Jr., P. J. Pankaskie, and E. R. Gilbert Feb. 1982 27 p refs Presented at the OECD Specialist Workshop on Tech. for the Dry Storage of Spent Fuel Elem., Madrid, 11-13 May 1982

(Contract DE-AC06-76RL-01830)

(DE82-014854; PNL-SA-10248; CONF-820578-1) Avail: NTIS HC A03/MF A01

Dry storage is emerging as an attractive and timely alternative to complement wet storage, and assist utilities to meet interim storage needs. Spent fuel is handled and stored under dry conditions. Dry storage of irradiated Zircaloy clad fuel in metal casks, drywells, silos and vaults is demonstrated. Hot cell and laboratory studies also are underway to investigate specific phenomena related to cladding behavior in dry storage. A substantial fraction of the LWR spent fuel inventory has aged for relatively long times and has relatively low decay heats. This suggests that much of the fuel inventory can be stored at relatively low temperatures. Alternatively, rod consolidation of the older can be considered without exceeding maximum cladding temperatures. DOE

**N83-24324#** Department of Energy, Aiken, S.C. Operations Office.
**EVALUATION AND SELECTION OF CANDIDATE HIGH-LEVEL WASTE FORMS**
Mar. 1982 109 p
(DE82-014134; DOE/TIC-11611) Avail: NTIS HC A06/MF A01

Seven candidate waste forms being developed under the direction of the Department of Energy's National High-Level Waste (HLW) Technology Program, were evaluated as potential media for the immobilization and geologic disposal of high-level nuclear wastes. The evaluation combined preliminary waste form evaluations conducted at DOE defense waste-sites and independent laboratories, peer review assessments, a product performance evaluation, and a processability analysis. Based on the combined results of these four inputs, two of the seven forms, borosilicate glass and a titanate based ceramic, SYNROC, were selected as the reference and alternative forms for continued development and evaluation in the National HLW Program. Both the glass and ceramic forms are viable candidates for use at each of the DOE defense waste-sites; they are also potential candidates for immobilization of commercial reprocessing wastes. This report describes the waste form screening process, and discusses each of the four major inputs considered in the selection of the two forms. DOE

**N83-24325#** Pacific Northwest Lab., Richland, Wash.
**ASSESSMENT OF EFFECTIVENESS OF GEOLOGIC ISOLATION SYSTEMS. THE DEVELOPMENT AND APPLICATION OF A GEOLOGIC SIMULATION MODEL**
M. G. Foley and G. M. Petrie Mar. 1982 11 p refs Presented at 10th Internatl. Math. and Computers Simulation Congr. on Systems Simulation and Sci. Computation, Montreal, 9 Aug. 1982
(Contract DE-AC06-76RL-01830)
(DE83-002015; PNL-SA-10295; CONF-820810-14) Avail: NTIS HC A02/MF A01

The Geologic Simulation Model (GSM) is a quasi-deterministic process response model which simulates the development of the geologic and hydrologic systems of a ground-water basin for a million years into the future. Effects of natural processes on the ground-water hydrologic system are modeled principally by rate equations. The combined effects and synergistic interactions of different processes are approximated by linear superposition of their effects during discrete time intervals in a stepwise-integration approach. The completed AEGIS GSM was used to generate 500 Monte Carlo simulations of the behavior of the geologic/hydrologic system affecting a hypothetical repository in the Pasco Basin over the next million years. DOE

**N83-24326#** Brown Univ., Providence, R. I.
**RESEARCH PROGRAM IN EXPERIMENTAL HIGH-ENERGY PHYSICS, TASK C Progress Report, 1 Jan. - 31 Dec. 1982**
R. E. Lanou, Jr. 30 Jul. 1982 112 p refs
(Contract DE-AC02-76ER-03130)
(DE82-019933; DOE/ER-03130/T8; COO-3130TC-7) Avail: NTIS HC A06/MF A01

An experimental program in strong and electro-weak interaction physics of elementary particles is being carried out using electronic detection techniques. Experiments have been performed or have been proposed utilizing the accelerators of the laboratories at Brookhaven, Fermilab, LAMPF, and SLAC. The experiments described in this report by the Electronic Detector Group include the following: (1) experiments to measure neutrino-electron and other neutral current phenomena, (2) studies for experiments at ISABELLE and the FNAL anti P P Collider, (3) neutrino oscillation experiments at BNL, and (4) development of a muon polarimeter. DOE

**N83-24327#** Los Alamos Scientific Lab., N. Mex.
**EVALUATION OF RESEARCH AND DEVELOPMENT FOR TERMINAL ISOLATION OF NUCLEAR WASTES**
Barry W. Burton Aug. 1982 26 p refs
(Contract W-7405-eng-36)
(DE82-021265; LA-9396-MS) Avail: NTIS HC A03/MF A01

The National Waste Terminal Storage program is responsible for identifying and constructing a geologic repository for spent reactor fuel, high level waste, and transuranic waste. Extensive research and development work is in progress in the areas of site selection, waste treatment and waste form development, model development and validation, and long term repository performance assessment. Many potential technologies are under investigation, but specific technologies cannot be identified until a repository site is selected. It is too early in the program to assess the adequacy of environmental control technologies for deep geologic disposal. DOE

# 74 OPTICS

Includes light phenomena.

**N83-24328#** Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
**FIELD DIFFRACTED BY A CURVED EDGE IN THE CAUSTIC REGION [CAMPO DIFRATADO POR UMA BORDA CURVA NA REGIAO DA CAUSTICA]**
Lucio Baptista Trannin Cividanes and Carlos Eduardo Santana Nov. 1982 28 p refs
(INPE-2590-PRE/238) Avail: NTIS HC A03/MF A01

Nowadays the method of Geometric Theory of Diffraction (GTD) is extensively used to calculate the diffracted field of a curved edge, mainly because it requires less computer time when compared to other methods (Physical Optics, as an example). However, it is inherent to the GTD that the calculated field diverges for observation points near the caustic. In this paper a correction factor to the GTD is presented, which permits the determination of the diffracted field in the region of the caustic. This factor has extreme computational speed in comparison with the equivalent edge currents method. The application of the GTD with this correction factor to calculate the scattered field from a paraboloidal reflector under axial plane wave illumination is described. The results are compared with those obtained by the Physical Optics method for observation points on the caustic in the near field region. Author

**N83-24329#** ITT Electro-Optical Products Div., Roanoke, Va.
**TWO WAVELENGTH OPTICAL MULTIPLEXING SYSTEM FOR ANALOG DATA LINK Final Technical Report, 28 Sep. 1981 - 30 Nov. 1982**
J. C. Williams and C. L. Kozikowski 3 Dec. 1982 32 p
(Contract N00014-81-C-2640)
(AD-A123090; ITT-82-47-06) Avail: NTIS HC A03/MF A01 CSCL 20/6

A codirectional two-channel wavelength division multiplexing system consisting of lensed dichroic multiplex and demultiplex couplers was designed, fabricated, and tested. Optical loss in either the 780 nm or 880 nm channels was about 4 dB and crosstalk rejection was 33 dB or greater. The couplers passed O C to +50 C temperature tests, vibration tests per MIL-T-1522F(AS), and mechanical shock tests. GRA

**N83-24330#** Saint Louis Univ., Mo. Dept. of Physics.
**A CATOPTRIC X-RAY OPTICAL SYSTEM (FOR USE IN LASER-FUSION DIAGNOSTICS) Final Technical Report, 15 Nov. 1977 - 30 Sep. 1982**
James F. McGee 30 Nov. 1982 94 p refs
(Grant AF-AFOSR-3480-78; AF Proj. 2301)
(AD-A123110; AFOSR-82-1052TR) Avail: NTIS HC A05/MF A01 CSCL 20/6

A compound X-ray imaging device has been developed as an aid in the diagnostics of a laser-fusion process which involves a pellet about 100 microns in diameter. The formation of images using X-rays is replete with geometrical aberrations among which are spherical, coma and the obliquity aberration. While techniques have been developed to minimize the spherical and obliquity aberration, coma continues to give trouble. The well known and

oft quoted Abbe's sine condition deals with coma in optical systems operating at normal incidence. Its application to X-ray systems operating at grazing angles of incidence is examined in detail. The result is the development of a new sine condition which is henceforth referred to as the modified sine condition. Its successful application to a multiple mirror X-ray focusing system is demonstrated. Author (GRA)

**N83-24331#** Ohio State Univ., Columbus.
**SEMICONDUCTOR SPATIAL LIGHT MODULATORS Final Report, 18 Mar. 1980 - 30 Jun. 1981**
Stuart A. Collins, Jr., Marlin O. Thurston, Gianfranco Gerosa, Jose A. Maiz, and Wisik Min Dec. 1982 109 p refs
(Contract DASG60-80-C-0037)
(AD-A122837) Avail: NTIS HC A06/MF A01 CSCL 20/6

The objective of this research was to evaluate techniques for modulating or switching one beam of light with another. The processes investigated were free carrier Faraday rotation, sensor-controlled optical emission, modulation of magnetic bubble diameter, selective pumping of an excited state in garnet with circularly polarized light, and modulation of optical absorption in silicon by pumping hole states. In the last method a control beam of wavelength 1.06 micrometers was used to modulate the transmission and reflection of a 10.59 micrometer beam. Author (GRA)

**N83-24332#** IBM Research Lab., San Jose, Calif. Dept. K46
**CRYOGENIC FREQUENCY DOMAIN OPTICAL MASS MEMORY**
Gary C. Bjorklund, Wilfried Lenth (MIT), and Carmen Ortiz (Inst. de Optica) 10 Dec. 1982 16 p refs Submitted for publication
(Contract N00014-81-C-0165; NR Proj. 421-001)
(AD-A122920; TR-2) Avail: NTIS HC A02/MF A01 CSCL 09/2

Cryogenic frequency domain optical memories based upon photochemical hole burning offer the possibility of storing data at densities of up to 10 to the 11th power bits/sq cm. The basic principles of photochemical hole burning are reviewed. Recent results on recording materials, data reading and writing, and system configurations are presented. Author (GRA)

**N83-24333#** IBM Research Lab., San Jose, Calif. Dept. K46.
**FREQUENCY DOMAIN OPTICAL STORAGE**
Gary C. Bjorklund and George Castro 20 Dec. 1982 41 p refs Submitted for publication
(Contract N00014-81-C-0165; NR Proj. 421-001)
(AD-A122886; TR-1) Avail: NTIS HC A03/MF A01 CSCL 20/6

The phenomenon of photochemical hole burning makes it possible to utilize optical frequency as an additional dimension for the organization of an optical data store. Storage densities of 10 to the 11th power bits/cm squared may ultimately be achieved. The basic principles of photochemical hole burning are reviewed in this paper and recent research results are presented. Author (GRA)

**N83-24334#** Mitre Corp., Bedford, Mass.
**FIBER OPTIC CABLE VULNERABILITY TEST, WHITE SANDS, NEW MEXICO**
S. F. Large and G. W. Styskal Hanscom AFB, Mass. AFSC Dec. 1982 23 p ref
(Contract F19628-82-C-0001)
(AD-A122911; MTR-8682; ESD-TR-82-259) Avail: NTIS HC A02/MF A01 CSCL 17/2

Tests were performed at the White Sands Missile Range, New Mexico, to evaluate the response of buried fiber optic cables to the accelerations and stresses developed by an explosive charge. During these tests, observations were made of cable transmissivity characteristics that might be affected by these forces. Transmission bit error rate (BER) measurements were made to determine cable performance changes. Author (GRA)

**N83-24335#** California Univ., Livermore. Lawrence Livermore Lab.
**OPTICAL-FABRICATION TECHNOLOGY: THE PRESENT AND A CRYSTAL-BALL VIEW INTO THE FUTURE**
Gregory M. Sanger 5 Oct. 1982 28 p refs Presented at the AIAA/SPIE/OSA Technol. for Space Astrophys. Conf., Danbury, Conn., 4 Oct. 1982
(Contract W-7405-eng-48)
(DE83-001177; UCRL-87682; CONF-821062-1; PN-82-1853-CP) Avail: NTIS HC A03/MF A01

Modern high technology optical surface manufacture makes use of one or more of four basic manufacturing technologies, loose abrasive grinding and polishing, single point diamond turning, multi-point (fixed-abrasive) machining, and position dependent material alteration. Each of these processes is described and a general comparison made with respect to achievable results, versatility and applicability to astrophysical, surveillance, and other advanced system applications. Such manufacturing technologies also offer a number of natural extensions which serve to provide, at least, a dim view down the development pathway. Such things as diamond turned visible light optics, single point machining of glass, precision fixed abrasive grinding, precise computer controlled polishing, and altered index materials are explored as offering exciting possibilities in the future. DOE

**N83-24336#** National Bureau of Standards, Boulder, Colo. Electromagnetic Technology Div.
**TECHNICAL DIGEST: SYMP. ON OPTICAL FIBER MEASUREMENTS**
D. L. Franzen, ed., G. W. Day, ed., and R. L. Gallawa, ed. Oct. 1982 153 p refs Symp. held in Boulder, Colo., 13-14 Oct. 1982
(PB83-129148; NBS-SP-641; LC-82-600594) Avail: NTIS HC A08/MF A01 CSCL 20F

This volume contains summaries of papers presented at the Symposium on Optical Fiber Measurements held October 13-14, 1982, at the National Bureau of Standards in Boulder, Colorado. Subjects include the measurement of attenuation, bandwidth, index profile/geometry, joint/defect, and single mode fibers. Also included are applied/field measurements and standards. GRA

**N83-24337#** Central Inst. for Industrial Research, Oslo (Norway). Dept. of Applied Mathematics.
**FOCUSING AND IMAGING: NEW METHODS FOR COMPUTING FIELDS IN FOCAL REGIONS**
Jakob J. Stamnes and E. Mehlum 13 Jul. 1982 16 p refs Presented at the SPIE Seminar on Applications of Mathematics in Modern Optics, San Diego, Calif., 24-25 Aug. 1982 Sponsored in part by the Royal Norwegian Council of Scientific and Industrial Research
(PB83-133751; ISBN-82-7267-467-9; Rept-82-03-03-5) Avail: NTIS HC A02/MF A01 CSCL 20F

Various efficient methods for computing fields in focal regions are reviewed. These methods involve local phase and amplitude approximations, asymptotic techniques and fast-Fourier-transform algorithms. Both ordinary and holographic lenses are considered. GRA

# 75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.

For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

**N83-24338*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
**RECONNECTION RATES, SMALL SCALE STRUCTURES AND SIMULATIONS**
W. H. Matthaeus Apr. 1983 11 p refs Presented at the Solar Terrest. Phys. Workshop
(Grant NsG-7416)
(NASA-TM-85177; NAS 1.15:85177) Avail: NTIS HC A02/MF A01 CSCL 20I

The study of reconnection in the context of one fluid, two dimensional magnetohydrodynamics (MHD), with spatially uniform constant density, viscosity and resistivity is though to retain most

of the physics important in reconnection. Much of the existing reconnection literature makes use of this approach. This discussion focuses on attempts to determine the properties of reconnection solutions to MHD as precisely as possible without regard to the intrinsic limitations of the model. Author

**N83-24339*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
**VISCOUS, RESISTIVE MHD STABILITY COMPUTED BY SPECTRAL TECHNIQUES**
R. B. Dahlburg, T. A. Zang, D. Montgomery, and M. Y. Hussaini [1983] 30 p refs Prepared in cooperation with College of William and Mary, Williamsburg, Va.
(Contracts NAS1-16394; NAS1-15810; Grants NsG-7416; NAG1-109; Contract DE-AS05-76ET-3045)
(NASA-TM-85318; NAS 1.15:85318) Avail: NTIS HC A03/MF A01 CSCL 20I

Expansions in Chebyshev polynomials are used to study the linear stability of one dimensional magnetohydrodynamic (MHD) quasi-equilibria, in the presence of finite resistivity and viscosity. The method is modeled on the one used by Orszag in accurate computation of solutions of the Orr-Sommerfeld equation. Two Reynolds like numbers involving Alfven speeds, length scales, kinematic viscosity, and magnetic diffusivity govern the stability boundaries, which are determined by the geometric mean of the two Reynolds like numbers. Marginal stability curves, growth rates versus Reynolds like numbers, and growth rates versus parallel wave numbers are exhibited. A numerical result which appears general is that instability was found to be associated with inflection points in the current profile, though no general analytical proof has emerged. It is possible that nonlinear subcritical three dimensional instabilities may exist, similar to those in Poiseuille and Couette flow. Author

**N83-24340*#** College of William and Mary, Williamsburg, Va. Dept. of Physics.
**DYNAMIC ALIGNMENT AND SELECTIVE DECAY IN MHD**
W. H. Matthaeus and D. Montgomery [1983] 14 p refs Sponsored in part by DOE
(Grant NsG-7416)
(NASA-CR-170259; NAS 1.26:170259) Avail: NTIS HC A02/MF A01 CSCL 20I

Under some circumstances, incompressible magnetohydrodynamic turbulence will evolve toward a state in which the velocity fields and magnetic fields are aligned or anti-aligned. We propose a mechanism for this effect and illustrate with numerical computations. Under some other circumstances, the energy appears to decay selectively toward a minimum energy state in which the kinetic energy has disappeared. It has not been possible so far to identify a boundary in the phase space which divides the two regimes. Author

**N83-24341#** Royal Inst. of Tech., Stockholm (Sweden). Dept. of Electron Physics.
**NUMERICAL DOUBLE LAYER SOLUTIONS WITH IONIZATION**
Dag Andersson and John Soerensen (ESTEC, Noorwidj, Netherlands) Aug. 1982 29 p refs Sponsored by ESA
(TRITA-EPP-82-06; ISSN-0348-7539) Avail: NTIS HC A03/MF A01

Maxwell's equation div D = rho in one dimension is solved numerically, taking ionization into account. Time independent anode sheath and double layer solutions are obtained. By varying voltage, neutral gas pressure, temperature of the trapped ions on the cathode side and density and temperature of the trapped electrons on the anode side, diagrams are constructed that show permissible combinations of these parameters. Results from a recent experiment form a subset. Distribution functions, the Langmuir condition, some scaling laws and a possible application to the lower ionosphere are discussed. S.L.

**N83-24342#** Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics.
**PLASMA PHYSICAL ASPECTS OF THE SOLAR CYCLE**
Michael A. Raadu Aug. 1982 18 p refs Presented at 1982 STP Symp., Ottawa, May 1982 Submitted for publication Sponsored by Swedish Natural Science Research Council
(TRITA-EPP-82-09; ISSN-0348-7539) Avail: NTIS HC A02/MF A01

Mass motions below the photosphere drive the solar cycle which is associated with variations in the magnetic field structure and accompanying phenomena. In addition to semi-empirical models, dynamo theories have been used to explain the solar cycle. The emergence of the magnetic field generated by these mechanisms and its expansion into the corona involves many plasma physical processes. Magnetic buoyancy aids the expulsion of magnetic flux. The corona may respond dynamically or by continually adjusting to a quasi-static force-free or pressure-balanced equilibrium. The formation and disruption of current sheets is significant for the overall structure of the coronal magnetic field and the physics of quiescent prominences. The corona has a fine structure consisting of magnetic loops. The structure and stability of these are important as they are one of the underlying elements which make up the corona. Author

**N83-24343#** Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics.
**RELATIVISTIC EFFECTS IN ELECTROSTATIC DOUBLE LAYERS**
Michael A. Raadu Aug. 1982 10 p refs Presented at Symp. on Plasma Double Layers, Risoe, Denmark, 16-18 Jun. 1982 Sponsored by Swedish Natural Reseach Council
(TRITA-EPP-82-11; ISSN-0348-7539) Avail: NTIS HC A02/MF A01

Relativistic effects must be taken into account in calculating the structure of double layers when the potential difference is sufficiently high. In relativistic double layers both ions and electrons are accelerated up to relativistic energies and their dynamics are consequently modified, whereas in the semirelativistic case only the electron motion is significantly affected. Relationships were derived between double layer parameters including the effects of relativistic dynamics. For nonzero injection velocities, a separate relation is found between the double layer potential and the boundary parameters. An approximate expression is found for the dependence of the potential difference on the current and thickness of a semirelativistic double layer. S.L.

**N83-24344#** Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics.
**ON THE NEGATIVE RESISTANCE OF DOUBLE LAYERS**
M. A. Raadu and M. B. Silevitch (Northeastern Univ., Boston) Aug. 1982 12 p refs Sponsored by Swedish Natural Science Research Council
(Grant AF-AFOSR-3731-78)
(TRITA-EPP-82-12; ISSN-0348-7539) Avail: NTIS HC A02/MF A01

The negative resistance calculation is examined by taking a detailed account of the constraints which are imposed on the electron distributions that exist in the double layer region. The role of the energetic trapped electrons which originate at the high potential side of the double layer is emphasized. S.L.

**N83-24345#** Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics.
**CIRCUIT EFFECTS ON PIERCE INSTABILITIES, AND DOUBLE LAYER FORMATION**
M. A. Raadu and M. B. Silevitch (Northeastern Univ., Boston) Nov. 1982 14 p refs Sponsored by Swedish Natural Science Research Council
(Grant AF-AFOSR-3731-78)
(TRITA-EPP82-15; ISSN-0348-7539) Avail: NTIS HC A02/MF A01

The role of the Pierce instability in the formation of double layers is considered and compared with that of the Buneman instability. Pierce instabilities were identified in a double layer experiment, where they lead to ion trapping. The effects of external circuit elements are considered. In the case of immobile ions the

onset criteria are unaffected, but in the unstable range the growth rate is reduced by the external impedance. Required experimental values of the circuit elements are estimated. The possible relevance to computer simulations is noted. M.G.

**N83-24346#** Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics.

**THE CRITICAL IONIZATION VELOCITY MECHANISM**

Michael A. Raadu Dec. 1982 15 p refs Presented at Max-Planck-Inst. fuer Extraterrestrische Phys. Workshop on the Critical Velocity Effect, Garching, West Germany, 11-13 Oct. 1982 Sponsored by Swedish Natural Science Research Council

(TRITA-EPP-82-16; ISSN-0348-7539) Avail: NTIS HC A02/MF A01

A review is presented of some recent work on aspects of the theory of the critical ionization velocity mechanism. Attention is concentrated on microscopic aspects, in particular the heating of electrons by the modified two-stream instability (MTSI) in the context of the circular feedback mechanism. Results are derived for the partition of energy between ions and electrons during the growth of the instability, where the parameter alpha = omega sub pe(2)/omega ce(2) is unrestricted. Electrons should be effectively energized for all values of alpha. Several macroscopic treatments of the critical ionization velocity mechanism are briefly mentioned. M.G.

**N83-24347#** Science Applications, Inc., Boulder, Colo. Plasma Research Inst.

**ANISOTROPIC PRESSURE AND FINITE HOT-ELECTRON LARMOR-RADIUS EFFECTS ON RING STABILITY**

K. T. Tsang, X. S. Lee, and P. J. Catto Sep. 1982 19 p refs

(Contract DE-AC03-76ET-53057)

(DE83-001001; SAI-254-82-274-LJ; PRI-51) Avail: NTIS HC A02/MF A01

The effect of the anisotropic pressure of a hot electron plasma on ballooning-interchange and compressional Alfven modes are investigated. General eigenmode equations for these modes are derived in the eikonal limit with finite gyro-radius effects retained. A local dispersion relation is obtained in the flute limit for an isotropic Maxwellian background plasma with a bi-Maxwellian hot electron population. Stability is investigated both analytically and numerically. DOE

**N83-24348#** California Univ., Livermore. Lawrence Livermore Lab. Magnetic Fusion Engineering Div.

**MECHANICAL-ENGINEERING ASPECTS OF MIRROR-FUSION TECHNOLOGY**

Dennis K. Fisher and James N. Doggett 15 Jul. 1982 8 p refs Presented at the ASME Winter Ann. Meeting, Pheonix, Ariz., 14-19 Nov. 1982

(Contract W-7405-eng-48)

(DE82-019240; UCRL-87347; CONF-821101-7) Avail: NTIS HC A02/MF A01

The mirror approach to magnetic fusion has evolved from the original simple mirror cell to today's mainline effort: the tandem-mirror machine with thermal barriers. Physics and engineering research is being conducted throughout the world, with major efforts in Japan, the USSR, and the US. At least one facility under construction will approach equivalent energy breakeven in physics performance. Significance mechanical engineering development is needed, however, before a demonstration reactor can be constructed. The principal areas crucial to mirror reactor development include large high-field superconducting magnets, high-speed continuous vacuum-pumping systems, long-pulse high-power neutral-beam and rf-plasma heating systems, and efficient high-voltage high-power direct converters. Other areas common to all fusion systems include tritium handling technology, first-wall materials development, and fusion blanket design. DOE

**N83-24349#** Oak Ridge National Lab., Tenn.

**STELLARATOR PHYSICS-EVALUATION STUDIES**

J. F. Lyon, B. A. Carreras, J. H. Harris, J. A. Rome, L. A. Charlton, R. A. Dory, R. H. Fowler, L. Garcia, T. C. Hender, and S. P. Hirshman 1982 11 p refs Presented at the 9th Intern. Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Baltimore, 1-8 Sep. 1982

(Contract W-7405-eng-26)

(DE82-022298; IAEA-CN-41/Q-3; CONF-820930-18) Avail: NTIS HC A02/MF A01

A wide range of stellarator/torsatron configurations is evaluated and compared using vacuum field flux surface topology, MHD equilibrium beta limits and guiding center orbit confinement as optimization criteria. The torsatron is found to be a better choice for a near term physics experiment than the modular stellarator or helical configurations studied. The best torsatron geometry has an equilibrium beta limit of < beta > = 4 to 5% for a plasma aspect ratio of 7 and 7 to 8% for an aspect ratio of 14. A feasible torsatron modularization scheme which retains the physics properties is shown. A wide variety of flux surface geometries can be produced due to the additional flexibility introduced by toroidally directed windbacks and compensating coils. The effects of different methods of calculating MHD equilibrium/stability, different pressure profiles, and different vertical fields on the results are discussed. Guiding center orbit containment is a less sensitive indicator of configuration quality than is the equilibrium beta limit. DOE

**N83-24350#** Los Alamos Scientific Lab., N. Mex.

**MODEL OF ENERGY CONFINEMENT IN THE REVERSED-FIELD PINCH**

Guthrie Miller Sep. 1982 10 p refs

(Contract W-7405-eng-36)

(DE83-002304; LA-9520-MS) Avail: NTIS HC A02/MF A01

Assuming Rusbridge's Tangled Discharge picture of the reversed-field pinch, a simple parallel transport model describing energy confinement is obtained. Properties of existing reversed field pinches are explained by assuming completely stochastic field lines. DOE

**N83-24351#** California Univ., Livermore. Lawrence Livermore Lab.

**DESIGN AND FABRICATION OF THE SUPERCONDUCTING-MAGNET SYSTEM FOR THE MIRROR FUSION TEST FACILITY (MFTF-B)**

R. F. Tatro, J. W. Wohlwend, and T. A. Kozman 3 Sep. 1982 8 p

(Contract W-7405-eng-48)

(DE83-000592; UCRL-15488) Avail: NTIS HC A02/MF A01

The superconducting magnet system for the Mirror Fusion Test Facility (MFTF-B) consists of 24 magnets; i.e., two pairs of C-shaped Yin-Yang coils, four C-shaped transition coils, four solenoidal axicell coils, and a 12 solenoid central cell. MFTF-B is not a magnetic development program, but rather a major physics experiment critical to the mirror fusion program. The basic philosophy has been to use proven materials and analytical techniques wherever possible. The transition and axicell coils are currently being analyzed and designed, while fabrication is under way on the solenoid magnets. DOE

**N83-24352#** Los Alamos Scientific Lab., N. Mex.

**TILTING MODE IN FIELD-REVERSED CONFIGURATIONS**

J. L. Schwarzmeier, D. C. Barnes, H. R. Lewis, C. E. Seyler, and A. I. Shestakov 1982 12 p refs Presented at the US-Japan Workshop on Compact Toroids, Osaka, 19-22 Oct. 1982

(Contract W-7405-eng-36)

(DE83-002067; LA-UR-82-2892; CONF-821059-1) Avail: NTIS HC A02/MF A01

Field reversed configurations (FRCs) experimentally have exhibited remarkable stability on the magnetohydrodynamic (MHD) timescale, despite numerous MHD calculations showing FRCs to be unstable. It is easy to believe that local modes are stabilized by finite Larmor radius (FLR) effects, but more puzzling is the apparent stability of FRCs against global modes, where one would expect FLR effects to be less important. The tilting mode, which MHD has shown to be a rapidly growing global mode was studied. The tilting mode in FRCs is driven by the pressure gradient, and magnetic compression and field line bending are the stabilizing

forces. A schematic of the evolution of the tilting mode is shown. The tilting mode is considered dangerous, because it would lead to rapid tearing across the separatrix. Unlike spheromaks, the tilting mode in FRCs has a separatrix that is fixed in space, so that the model is strictly internal. DOE

**N83-24353#** California Univ., Livermore. Lawrence Livermore Lab.
**DEVELOPMENT OF A MAGNETOHYDRODYNAMIC CODE FOR AXISYMMETRIC, HIGH-BETA PLASMAS WITH COMPLEX MAGNETIC FIELDS Ph.D. Thesis - Brigham Young Univ.**
Grant O. Cook, Jr. Dec. 1982 330 p refs
(Contract W-7405-eng-48)
(DE83-001917; UCRL-53324) Avail: NTIS HC A15/MF A01

The Topolotron is an axisymmetric, toroidal magnetic fusion concept in which two dimensional effects are important, as well as all three magnetic field components. The particular MHD model employed is basically the one-fluid, two-temperature model using classical Braginskii transport with viscous effects ignored. The model is augmented by Saha-Boltzmann dissociation and partial ionization physics, a simple radiation loss mechanism, and an additional resistivity due to electron-neutral collisions. While retaining all velocity and magnetic field components, the assumption of axisymmetry is made, and the resulting equations are expanded in cylindrical coordinate. The major approximation technique is then applied: spline collocation, which reduces these equations to a set of ordinary differential equations. DOE

**N83-24354#** Wisconsin Univ., Madison. Fusion Engineering Program.
**UNIVERSITY OF WISCONSIN FUSION-ENGINEERING PROGRAM DESIGN ACTIVITIES FOR THE LIGHT-ION-BEAM FUSION TARGET-DEVELOPMENT FACILITY Final Report, Aug. 1981 - Feb. 1982**
B. Badget, R. L. Engelstad, A. M. Hassanein, G. L. Kulcinski, K. J. Lee, E. G. Lovell, T. J. McCarville, G. A. Moses, R. R. Peterson, and I. N. Sviatoslavsky Feb. 1982 169 p refs
(Contract DE-AS08-81DP-40161)
(DE83-001829; DOE/DP-40161/1; UWFDM-457) Avail: NTIS HC A08/MF A01

Suitable structural materials for the first wall and support frame are determined. The mechanical design of the first wall and frame is described. The methods developed to analyze the frame's response to the blast overpressure and results in the area of cavity gas dynamics calculations are discussed. DOE

**N83-24355#** Argonne National Lab., Ill.
**PROGRAM PLAN FOR THE DOE OFFICE OF FUSION ENERGY FIRST WALL/BLANKET/SHIELD ENGINEERING TECHNOLOGY PROGRAM. VOLUME 2: DETAILED TECHNICAL PLAN**
Aug. 1982 154 p refs Revised
(Contract W-31-109-eng-38)
(DE83-000861; ANL/FPP/TM-161-Vol-2-Rev-2) Avail: NTIS HC A08/MF A01

The plan for conducting selected aspects of the engineering testing required for magnetic fusion reactor First Wall/Blanket/Shield (FWBS) components and systems is presented. An established data base that contributes to a functional, reliable, maintainable, economically attractive, and environmentally acceptable commercial fusion reactor first wall, blanket, and shield system is furnished. Activities, responsibilities, and program management including reporting and interfaces with other programs are summarized. Detailed near term research, development, and testing required to establish a FWBS engineering data base are delineated. Optimum testing strategies and construction of test facilities where needed are identified. DOE

**N83-24356#** Argonne National Lab., Ill.
**PROGRAM PLAN FOR THE DOE OFFICE OF FUSION ENERGY FIRST WALL/BLANKET/SHIELD ENGINEERING TECHNOLOGY PROGRAM. VOLUME 1: SUMMARY, OBJECTIVES AND MANAGEMENT**
Aug. 1982 82 p refs Revised
(Contract W-31-109-eng-38)
(DE83-000862; ANL/FPP/TM-161-Vol-1-Rev-2) Avail: NTIS HC A05/MF A01

Together the first wall, blanket and shield provide a nuclear envelope that isolates the fusion plasma and the energetic particles produced by the plasma from the rest of the fusion reactor. These components in STARFIRE, a conceptual design for a commercial Tokamak fusion reactor, and in a tandem mirror reactor are shown. First wall components directly face the plasma and are subjected to a severe environment including intense (photon) radiation and bombardment by high energy neutrons and energetic particles from the plasma. The primary function of the first wall and first wall components (armor, limiters, diverters) is to maintain the physical boundary that defines the plasma chamber without adversely affecting the plasma (by introducing impurities). Rejection of the intense surface heat loads is an important requirement in fulfilling this function. The blanket has two functions: generating heat and producing tritium with methods suitable for their extraction from the blanket. DOE

**N83-24357#** Sandia Labs., Albuquerque, N. Mex.
**THE CHARACTERISTICS OF LIGHT-ION-BEAM FUSION SYSTEMS**
C. W. Mendel, Jr. 1982 19 p refs Presented at the Workshop on Diagn. for Fusion Reactor Conditions, Varenna, Italy, 6 Sep. 1982
(Contract DE-AC04-76DP-00789)
(DE82-021080; SAND-82-1251C; CONF-820944-3) Avail: NTIS HC A02/MF A01

The conditions for light ion beam fusion are extreme, involving large energies and short times, and the diagnostics needed for experiments are generally very different from those in other fusion fields. The only closely related field is that of laser fusion where the energies are smaller, but the times are even shorter. Typical particle beam fusion conditions require power densities of the order of 10 to the 14th power watts/sq cm on targets of 5 to 10 mm diameter. The beam pulse should be about 10 ns long at the target. The first lecture describes the state of present particle beam pulser technology, the diode concepts which are used in converting the electromagnetic pulse to particle beam energy, and the transport and focusing of the beam. DOE

**N83-24358#** California Univ., Livermore. Lawrence Livermore Lab.
**NEUTRONIC IMPLICATIONS OF LEAD-LITHIUM BLANKETS**
Wayne R. Meier Aug. 1982 15 p refs Presented at the 12th Symp. on Fusion Technol., Juelich, West Germany, 13-17 Sep. 1982
(Contract W-7405-eng-48)
(DE82-021629; UCRL-87499; CONF-820948-1) Avail: NTIS HC A02/MF A01

Lead lithium alloys have been proposed for use in several conceptual blanket designs for both inertial and magnetic confinement fusion reactors. In most cases, Pb83Li17, a eutectic with a melting point of 235 C, is the chosen composition. The primary reasons for using Pb83Li17 instead of Li as the tritium breeding material are the perceived safety advantages, low tritium solubility, and favorable neutronic characteristics. The neutronic characteristics of Pb83Li17 blankets are described with emphasis on the enhanced neutron leakage through chamber ports and the degradation in blanket performance parameters that occurs as a result of the enhanced leakage. DOE

**N83-24359#** California Univ., Livermore. Lawrence Livermore Lab.
**TMX TANDEM-MIRROR EXPERIMENTS AND THERMAL-BARRIER THEORETICAL STUDIES**
T. C. Simonen, D. E. Baldwin, S. L. Allen, W. L. Barr, T. A. Casper, Y. J. Chen, J. F. Clauser, F. H. Coensgen, R. H. Cohen, and D. L. Correll 29 Jul. 1982 18 p refs Presented at the 9th Intern. Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Baltimore, 1-8 Sep. 1982 Prepared in cooperation with Sandia Labs, Livermore, Calif., Rensselaer Polytechnic Inst., Troy, N.Y., Johns

Hopkins Univ., Baltimore, Md., Wisconsin Univ., Madison, and California Univ., Berkeley.
(Contract W-7405-eng-48)
(DE82-020850; UCRL-87948-Rev-1; CONF-820930-10-Rev-1) Avail: NTIS HC A02/MF A01

Recent analysis of energy confinement in the Tandem Mirror Experiment (TMX) are described. TMX data also indicates that warm plasma limits the amplitude of the anisotropy driven Alfven ion cyclotron (AIC) code. Theoretical calculations show strong AIC stabilization with off normal beam injection as planned in TMX-U and MFTF-B. Results of theoretical analysis of hot electrons in thermal barriers including electron heating calculations by Monte Carlo and Fokker-Planck codes and analysis of hot electron MHD and microinstability are reported. Initial results from the TMX-U experiment are presented which show the presence of sloshing ions. DOE

**N83-24360#** Texas Univ., Austin. Inst. for Fusion Studies.
**CURVATURE-DRIVEN INSTABILITIES IN THE ELMO BUMPY TORUS (EBT)**
H. Abe, H. L. Berk, C. Z. Chen, M. N. Rosenbluth, J. W. VanDam, D. A. Spong, N. A. Uckan, T. M. Antonsen, Jr., Y. C. Lee, and K. T. Tsang 1982 17 p refs Presented at the 9th Intern. Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Baltimore, 1-8 Sep. 1982 Prepared in cooperation with ORNL, Maryland Univ., Science Applications, Inc. and Michigan, Univ. Sponsored in part by the NSF
(Contracts DE-FG05-80ET-53088; W-7405-eng-26; DE-AC03-76ET-53057)
(DE82-022334; IAEA-CN-41/T-6-1; CONF-820930-16) Avail: NTIS HC A02/MF A01

Curvature-driven instabilities are analyzed for an EBT configuration which consists of plasma interacting with a hot electron ring whose drift frequencies are larger than the growth rates predicted from conventional magnetohydrodynamic (MHD) theory. Stability criteria are obtained for five possible modes: the conventional hot electron interchange, a high-frequency hot electron interchange (at frequencies greater than the ion-cyclotron frequency), a compressional instability, a background plasma interchange, and an interacting pressure-driven interchange. A wide parameter regime for stable operation is found, which, however, severely deteriorates for a band of intermediate mode numbers. Finite Larmor radius effects can eliminate this deterioration. DOE

**N83-24361#** Wisconsin Univ., Madison. Dept. of Nuclear Engineering and Physics.
**FUSION PLASMA THEORY. TASK 1: MAGNETIC CONFINEMENT FUSION PLASMA THEORY Annual Progress Report, 1 Jan. - 31 Dec. 1982**
J. D. Callen Aug. 1982 15 p refs
(Contract DE-AC02-80ER-53104)
(DE82-020972; DOE/ER-53104/2) Avail: NTIS HC A02/MF A01

Tandem mirror confinement and heating issues (barrier trapping current, rf heating, low mode number stability) were investigated. A comprehensive neoclassical transport theory for nonaxisymmetric toroidal plasmas (e.g., stellarators) was developed. Progress in these and some other miscellaneous areas are summarized. DOE

**N83-24362#** Texas Univ., Austin. Inst. for Fusion Studies.
**SOLITARY DRIFT WAVES IN THE PRESENCE OF MAGNETIC SHEAR**
J. D. Meiss and W. Horton Jul. 1982 37 p refs
(Contract DE-FG05-80ET-53088)
(DE83-000116; DOE/ET-53088/60; IFSR-60) Avail: NTIS HC A03/MF A01

The two-component fluid equations describing electron drift and ion acoustic waves in a nonuniform magnetized plasma are shown to possess nonlinear two-dimensional solitary wave solutions. In the presence of magnetic shear, radiative shear damping is exponentially small in L/sub s//L/sub n/ for solitary drift waves, in contrast to linear waves. DOE

**N83-24363#** Los Alamos Scientific Lab., N. Mex.
**EXPERIMENTAL STUDIES OF FIELD-REVERSED-CONFIGURATIONS (FRC)**
R. E. Siemon, W. T. Armstrong, and R. R. Bartsch 1982 13 p refs Presented at 9th Internatl. Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Baltimore, 1 Sep. 1982
(Contract W-7405-eng-36)
(DE82-022014; LA-UR-82-2543; CONF-820930-14) Avail: NTIS HC A02/MF A01

A primary purpose of the large bore (0.5 m dia.) FRX-C field reversed theta pinch experiment is to study the scaling of plasma particle containment time, tau/sub N/, with major radius, R, of the field reversed configuration (FRC). At 20 m torr fill pressure the FRX-C plasma parameters, anti n approximately 4 x 10 to the 15th power/cu cm, T/sub e/ approximately 100 eV, T/sub i/ approximately 150 eV, are comparable to those obtained in the smaller bore (0.25 m dia.) FRX-B device. Under these conditions, the present measurement of particle confinement time in FRX-C is tau/sub N/ approximately 140 microseconds, consistent with the scaling tau/sub N/ alpha R squared, when compared with the earlier FRX-B results. This favorable scaling has been observed with R/rho/sub i/ approximately 30 (rho/ sub i/ = ion gyro radius), twice as large as in FRX-B, despite theoretical indications that various MHD instabilities would appear as R/rho/sub i/ was increased. The characteristics of hotter, neutron generating FRC plasma produced at lower fill pressure (5 m torr), where anti n approximately 2 x 10 to the 15th power/cu cm, T/sub e/ approximately 170 eV, T/sub i/ approximately 600 nation of tau/sub N/ is difficult because of the short stable period observed. DOE

**N83-24364#** Los Alamos Scientific Lab., N. Mex.
**HIGH-DENSITY-PLASMA DIAGNOSTICS IN MAGNETIC-CONFINEMENT FUSION**
F. C. Jahoda 1982 51 p refs Presented at Workshop on Diagnostics for Fusion Reactor Conditions, Varenna, Italy, 6 Sep. 1982
(DE82-021897; LA-UR-82-2466; CONF-820944-1) Avail: NTIS HC A04/MF A01

The lectures begin by defining high density in the context of magnetic confinement fusion research and listing some alternative reactor concepts, ranging from n/sub e/ approximately 2 x 10 to the 14th power/cu cm to several orders of magnitude greater, that offer potential advantages over the main-line, n/sub e/ approximately 10 to the 14th power/cu cm, Tokamak reactor designs The high density scalings of several major diagnostic techniques, some favorable and some disadvantageous, will be discussed. Special emphasis will be given to interferometric methods, both electronic and photographic, for which integral n/sub e/d1 measurements and associated techniques are accessible with low wavelength lasers. Reactor relevant experience from higher density, smaller dimension devices exists. High density implies high beta, which implies economies of scale. The specialized features of high beta diagnostics will be discussed. DOE

**N83-24365#** Los Alamos Scientific Lab., N. Mex.
**DYNAMICAL PROCESSES IN THE REVERSED-FIELD PINCH**
E. Caramana, T. Cayton, R. Dagazian, D. Hewett, T. Hewitt, R. Lewis, J. Mondt, R. Nebel, D. Schnack, and C. Seyler 1982 13 p refs Presented at 9th Intern. Conf. on Plasma Phys. and Controlled Nucl. Fusion Res. (IAEA), Baltimore, 1-8 Sep. 1982
(DE82-021771; LA-UR-82-2340; CONF-820930-13) Avail: NTIS HC A02/MF A01

A review of recent theoretical work on the Reversed-Field Pinch (RFP) at Los Alamos National Laboratory is presented. A wide variety of topics are discussed. These include: nonlinear, two-dimensional, helical, magnetohydrodynamic (MHD) simulations of current-driven modes; a statistical model of plasma turbulence in the RFP; analytic and numerical calculations of resistive ballooning modes in toroidal geometry; work on coherent m = 0 excitations observed in the ZT-40M device; finite Larmor radius effects on the tearing mode; destabilization of MHD modes by kinetic effects; and, possible plasma heating by means of magnetoacoustic oscillations. DOE

**N83-24366#** Austin Research Associates, Inc., Tex.
**ANALYTICAL STUDY OF TRANSPORT MECHANISMS FOR ENERGETIC-ION HEATING OF INTOR-SIZE TOKAMAKS Quarterly Technical Report, 2 Jun. - 31 Aug. 1982**
W. E. Drummond Sep. 1982 49 p refs
(Contract DE-AC05-82ER-53131)
(DE82-020971; DOE/ER-53131/1; COO-3131-1) Avail: NTIS HC A03/MF A01

The Tokamak and injected ion parameters are summarized. The physics involved with the most promising of the methods of transport, namely the grad-B transport scheme, is examined in detail. Under this analysis, a class of particles is discovered which cannot be transported to the edge of the plasma except through use of magnetically shielded transport systems. The use of shielded transport systems for such particles is discussed and shown to be unfortunately incompatible with known injection requirements. The third transport scheme, that of ballistic transport, is discussed and its limitations noted. DOE

**N83-24367#** Illinois Univ., Urbana. Fusion Studies Lab.
**VARIANCE-REDUCTION TECHNIQUE FOR COULOMB-NUCLEAR THERMALIZATION OF ENERGETIC FUSION PRODUCTS IN HOT PLASMAS**
J. C. DeVeaux and G. H. Miley 1982 6 p refs Presented at Am. Nucl. Soc. Winter Meeting, Washington, D.C., 14 Nov. 1982
(Contract DE-AC02-76ET-52040)
(DE82-020203; CONF-821103-16; COO-2218-250) Avail: NTIS HC A02/MF A01

A variance reduction technique involving use of exponential transform and angular biasing methods was developed. Its purpose is to minimize the variance and computer time involved in estimating the mean fusion product (fp) energy deposited in a hot multiregion plasma under the influence of small energy transfer Coulomb collisions and large energy transfer nuclear elastic scattering (NES) events. This technique is applicable to high temperature D He-3, Cat. D and D-T plasmas which have highly energetic fps capable of undergoing NES. A first application of this technique is made to a D-He-3 field reversed mirror (FRM) where the Larmor radius of the 14.7 MeV photons are typically comparable to the plasma radius (plasma radius approximately 2 fp gyroradii) and the optimistic fp confinement (approximately 45% of 14.7 MeV protons) previousiy predicted is vulnerable to large orbit perturbations induced by NES. In the FRM problem, this variance reduction technique is used to estimate the fractional difference in the average fp energy deposited in the closed field region, E/sub cf/, with and without NES collisions. DOE

**N83-24368#** Sandia Labs., Albuquerque, N. Mex. Pulsed Power Engineering Div.
**ENGINEERING ASPECTS OF PARTICLE-BEAM FUSION SYSTEMS**
D. L. Cook 1982 5 p refs Presented at the ASME Winter Ann. Meeting, Phoenix, Ariz., 14 Nov. 1982
(Contract DE-AC04-76DP-00789)
(DE82-018645; SAND-82-1586C; CONF-821101-6) Avail: NTIS HC A02/MF A01

The DT fuel ignition in an Inertial Confinement Fusion (ICF) capsule is demonstrated. As part of the ICF effort, two major Particle Beam Fusion Accelerators are being developed with the objective of providing energetic light ion beams of sufficient power density for target implosion. Supporting light ion beam research is being performed. If the answers to several key physics and engineering questions are favorable, pulsed power accelerators will be able to provide an efficient and inexpensive approach to high target gain and eventual power production applications. DOE

**N83-24369#** Princeton Univ., N. J. Plasma Physics Lab.
**OPTIMIZATION OF STEADY-STATE BEAM DRIVEN TOKAMAK REACTORS**
D. R. Mikkelsen and C. E. Singer Sep. 1982 53 p refs
(Contract DE-AC02-76CH-03073)
(DE82-022232; PPPL-1929) Avail: NTIS HC A04/MF A01

A mathematical reactor model is developed which includes the physics of beam driven currents and reactor power balance, as well as reactor and beam system costs. This model is used to find the plasma temperatures which minimize the reactor cost per unit of net electrical output. The optimum plasma temperatures are nearly independent of beta and are roughly twice as high as the optimum temperatures for ignited reactors. If beams of neutral deuterium atoms with near optimum energies of 1 to 2 MeV are used to drive the current in an INTOR sized reactor, then the optimum temperatures are typically T/sub e approximately or = to 12 to 15 keV and T/sub i/ approximately or = to keV for a wide range of model parameters. Net electrical output rises rapidly with increasing deuterium beam energy for E/sub b/ < or = to approximately 400 keV, but rises only slowly above E/sub b/ approximately 1 MeV. It is estimated that beam driven steady state ractors be economically competitive with pulsed ignition reactors if cyclic loading problems limit the toroidal magnetic field strength of pulsed reactors to approximately 85% of that allowed in steady state reactors. DOE

**N83-24370#** Los Alamos Scientific Lab., N. Mex.
**PERFORMANCE OF THE ZT-40M REVERSED-FIELD PINCH WITH AN INCONEL LINER**
D. A. Baker, M. D. Bausman, C. J. Buchenauer, L. C. Burkhardt, G. Chandler, J. N. DiMarco, J. N. Downing, P. R. Forman, R. F. Gribble, A. Haberstich et al 1982 14 p refs Presented at the 9th IAEA Meeting, Baltimore, 1-8 Sep. 1982
(Contract W-7405-eng-36)
(DE82-022020; LA-UR-82-2531; CONF-820930-12) Avail: NTIS HC A02/MF A01

Modifications made to ZT-40 have substantially improved plasma parameters: pinch resistance has decreased by more than an order of magnitude, T sub e has exceeded 300 eV, and with power crowbar operation > 20 ms steady-state discharges have been obtained. With a beta of 0.1, and the assumptions of modified Bessel function magnetic-field profiles and classical ohmic heating the energy confinement time, 0.2 ms, is close to that expected for the measured temperatures and discharge currents. A relaxation process (dynamo) sustains reversed field pinch (RFP) profiles extending discharge life-times beyond the limit predicted by classical resistive diffusion. If the process continues to operate, a steady-stte RFP is possible. Extension of the toroidal current risetime to the experiment's design limit (1.5 ms) indicates that RFPs can be formed at still longer rise-times with reasonable voltsecond and energy inputs facilitating the design of future experiments. These results represent a significant advance for the RFP concept toward a viable ohmic-heated magnetic-fusion system. DOE

**N83-24371#** Wisconsin Univ., Madison.
**HIGH-BETA MULTIPOLES**
Stewart C. Prager Jun. 1982 36 p refs Presented at the Symp. on New Trends in Unconventional Approaches to Magnetic Fusion, Stockholm, Jun. 1982
(Contract DE-AC02-76ET-53051)
(DE82-015672; DOE/ET-53051/37) Avail: NTIS HC A03/MF A01

Multipoles are being employed as devices to study fusion issues and plasma phenomena at high values of beta (plasma pressure/magnetic pressure) in a controlled manner. Due to their large volume, low magnetic field (low synchrotron radiation) region, they are also under consideration as potential steady state advanced fuel (low neutron yield) reactors. Present experiments are investigating neoclassical (bootstrap and Pfirsch-Schlueter) currents and plasma stability at extremely high beta. DOE

**N83-24372#** Kiruna Geophysical Inst. (Sweden).
**COMPUTATION OF THE DIELECTRIC TENSOR OF A MAXWELLIAN PLASMA**
Kjell Roennmark Nov. 1982 9 p refs Submitted for publication
(KGI-Preprint-058; ISSN-0349-2656) Avail: NTIS HC A02/MF A01

Very good rational approximations for the plasma dispersion function Z(s) were recently derived by a modified Pade method.

Evaluation of the dielectric tensor of a Maxwellian plasma is considerably simplified by the introduction of such approximants, which are expanded in partial fractions. A computer code based on this method was developed and found very useful in practical computations. Author

**N83-24373#** Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics.
**THE CRITICAL IONIZATION VELOCITY MECHANISM FOR THE CASE OF GAS MIXTURES**
Michael A. Raadu Aug. 1982 8 p refs Presented at Intern. Conf. on Plasma Phys., Goteborg, 9-15 Jun. 1982 Sponsored by Swedish Natural Science Research Council
(TRITA-EPP-82-10; ISSN-0348-7539) Avail: NTIS HC A02/MF A01

The theory of the critical ionization velocity mechanism is discussed. In the case of gas mixtures the critical velocity is expected to depend on the ionization cross sections. An analytic approximation is introduced which can be used to set limits on a generalized expression for the critical velocity of gas mixtures. Author

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Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

**N83-24374#** Heraeus (W. C.) G.m.b.H., Hanau (West Germany).
**GROWN QUARTZ CRYSTALS TO BE USED FOR THE PRODUCTION OF FUSED SILICA Final Report, Mar. 1981**
Rolf Bruening and Norbert Cibis Bonn Bundesministerium fuer Forschung und Technologie Nov. 1982 65 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-199; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Ger. DM 14

Grown quartz crystals, as they are used for the production of piezo-quartz-slices, may substitute natural rock crystal as a raw material for producing optical fused silica, seen from a technical point of view. Comparable: thermal expansion, viscosity, devitrification, advantages: better UV-transmission, lower aluminum contents and disadvantages: higher contents of sodium and iron, and lower resistance to irradiation. The influences of nutrient silica and operation conditions during crystal growth were investigated. Author

**N83-24375#** Stuttgart Univ. (West Germany). Inst. fuer Netzwerk- und Systemtheorie.
**HYBRID FILM CIRCUITS FOR CUTT-OFF FREQUENCIES UP TO 10MHz IN TANTALUM THIN-FILM TECHNOLOGY Final Report, Jun. 1981**
Franz Zapf Bonn Bundesministerium fuer Forschung und Technologie Dec. 1982 73 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-221; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 15,50

In this report the design and the manufacture of the AM-IF-Filter and the FM-IF-Filter in RC-line-technique as well as a deterministic tuning algorithm for circuits with RC-lines are described. The RC-active AM- and FM-IF-Filters require broadband amplifier circuits (White-Follower). The RC-lines are realized by a single sputtered film out of Ta-oxinitride with a nearly temperature compensated time constant R.C. Author

**N83-24376#** Erlangen-Nuremberg Univ. (West Germany). Inst. fuer Angewandte Physik.
**INTERFACE STATE ANALYSIS IN MOS DEVICES Final Report, Jul. 1981**
Max Schulz, Karl Hofmann, Helmut Lefevre, Xiangqin Zheng, and Karl Blumenstock Bonn Bundesministerium fuer Forschung und Technologie Dec. 1982 222 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-222; ISSN-0340-7608) Avail: NTIS HC A10/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 39

Oxygen implantation in MOS structures showed little influence on stoichiometry and interface state density after annealing. In MOS structures, interface traps at the Si-SiO2 interface are observed and separated from traps in the nitride. IR-excitation of interface traps showed a low absorption cross section. An increased density of interface traps is observed at the boundary of microstructures. Author

**N83-24377#** Semikron Gesellschaft fuer Gleichrichterbau und Elektronik m.b.H., Nuremberg (West Germany).
**SEMICONDUCTOR POWER DEVICES FOR CHOPPER APPLICATIONS AT FREQUENCIES OF 20 kHz AND HIGHER, AND FOR 5 TO 20 kVA POWER OUTPUT Final Report, Mar. 1982**
Reinhard Grube, Werner Tursky, Stefan Gerzovskovits, and Winfried Schierz Bonn Bundesministerium fuer Forschung und Technologie Dec. 1982 61 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-227; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 13

An asymmetrical gate assisted turn-off thyristor and two types of rectifier diodes were developed. These devices are suitable for self-commutated convertors working at frequencies between 15 and 30 kHz for direct connection to 380 V and 500 V lines and for power outputs up to 20 kVA. Such convertors allow economic and easily controllable power supplies to be realized for applications such as welding, inductive heating, ultrasonic generators, and radar modulators. Author

**N83-24378#** Aerospace Corp., El Segundo, Calif. Chemistry and Physics Lab.
**XPS STUDY OF CHEMICALLY ETCHED GaAs AND InP**
P. A. Bertrand 15 Mar. 1982 26 p refs
(Contract F04701-81-C-0082)
(AD-A113099; SD-TR-81-103; TR-0082(2945-03)-1) Avail: NTIS HC A03/MF A01 CSCL 20/12

The surface composition of p-type GaAs etched in HCl or Br2 in methanol, and n-type InP etched in HCl, H2SO4, HNO3 or Br2 in methanol were studied by means of X-ray photoelectron spectroscopy (XPS). The surface compositions of GaAs and the binding energy of the surface As atoms vary with the etching solution and with the extent of oxidation of the surface. The full width at half-maximum of the Ga(3p) photoelectron peak increases upon exposure of etched GaAs to air. The XPS results are compared with Schottky barrier heights previously measured for similarly prepared surfaces with Pb contacts. The amount of oxidized P on InP surfaces is higher after an HNO3 etch than after HCl, H2SO4, of Br2/methanol treatments. An HCl etch leaves an unoxidized slightly In-rich surface. M.G.

**N83-24379#** Rockwell International Corp., Thousand Oaks, Calif. Microelectronics Research and Development Center.
**TEMPERATURE COMPENSATED PIEZOELECTRIC MATERIALS Final Technical Report, 15 May 1978 - 15 May 1982**
R. R. Neugaonkar and L. E. Cross Sep. 1982 100 p refs
(Contract F49620-78-C-0093; ARPA Order 3570)
(AD-A123100; MRDC41007.24FR; AFOSR-82-1069TR) Avail: NTIS HC A05/MF A01 CSCL 20C

A full phenomenological model has been developed to predict the dielectric, piezoelectric and elastic compliances and their temperature behavior for bronze structure ferroelectrics. The model is based on an extension of the Landau: Ginsburg: Devonshire phenomenology which includes the diffuse nature of the curie transition at TC. Sixth rank electrostrictive coupling terms have

been found necessary to adequately describe the paraelectric phase above the curie temperature; these terms do not appear to change markedly with caution substitution. GRA

**N83-24380#** Brown Univ., Providence, R. I. Dept. of Chemistry.
**PREPARATION AND CHARACTERISTICS OF Cd.95Mn.05Se SINGLE CRYSTALS**
B. Khazai, R. Kershaw, K. Dwight, and A. Wold 3 Jan. 1983 19 p refs Submitted for publication
(Contract N00014-77-C-0387; NR Proj. 359-653)
(AD-A123121; TR-25) Avail: NTIS HC A02/MF A01 CSCL 20/2

Homogeneous crystals of Cd.95Mn.05Se of high optical quality have been grown by a modified Bridgman method. Magnetic susceptibility measurements verify the uniform distribution of Mn(II) obtained after annealing at 600 degrees C. Crystals grown in the presence of 5 atomic percent excess selenium showed high resistivity; the addition of 1 mg iodine to a 10 g charge resulted in n-type conductivity and a room-temperature carrier concentration 3/2.9 x 10 to the 16th power cm. GRA

**N83-24381#** Spectron Development Labs., Inc., Costa Mesa, Calif.
**INVESTIGATION OF THE RAYLEIGH CRITICAL ANGLE PHENOMENON FOR THE CHARACTERIZATION OF SURFACE PROPERTIES Interim Report, 1 Jul. - 30 Sep. 1982 on phase 2**
B. P. Hildebranc, G. L. Fitzpatrick, and A. J. Boland 30 Sep. 1983 66 p refs
(Contract F49620-81-C-0040; ARPA Order 4109; AF Proj. 2306)
(AD-A123145; SDL-82-2188-11TR; AFOSR-82-1061TR) Avail: NTIS HC A04/MF A01 CSCL 20/2

A series of experiments on single crystals and other materials of a controlled nature have been preferred. These experiments have provided strong constraints on the interpretation of critical angle measurements made with an apparatus which employs a focused acoustic source rather than a plane wave source. Certain anomalous measurements reported earlier on uncontrolled materials have been seen again in these controlled materials. GRA

**N83-24382#** IBM Research Lab., San Jose, Calif. Dept. K46.
**HIGH RESOLUTION STARK SPECTROSCOPY OF THE 6070A COLOUR CENTRE IN NaF USING SPECTRAL HOLEBURNING**
R. T. Harley and R. M. Macfarlane 21 Dec. 1982 24 p refs Submitted for publication
(Contract N00014-81-C-0165; NR Proj. 421-001)
(AD-A122887; TR-3) Avail: NTIS HC A02/MF A01 CSCL 20/2

The nature of the 6070A, color center in NaF has been investigated using high resolution spectral holeburning. The previous assignment of this line to an N1 center with C2h symmetry was found to be inconsistent with these new experimental results. Possible alternative defect structures are considered. Author (GRA)

**N83-24383#** North Carolina Univ., Chapel Hill. Dept. of Chemistry.
**SINGLE CRYSTAL MAGNETIC STUDY ON FERROMAGNETIC MANGANESE (2) PHTHALOCYANINE Interim Technical Report**
Samaresh Mitra, A. K. Gregson, William E. Hatfield, and Robert R. Weller 1 Dec. 1982 30 p refs Submitted for publication
(Contract N00014-76-C-0816; NR Proj. 053-617)
(AD-A122860; TR-19) Avail: NTIS HC A03/MF A01 CSCL 20/3

A magnetic study has been carried out in the temperature range 1.2-25 K and magnetic field range 0 to 50 kOe on single crystals of manganese (II) phthalocyanine. At higher temperatures the magnetic properties of manganese (II) phthalocyanine exhibit chain-like characteristics which may be understood in terms of ferromagnetic Heisenberg intrachain exchange of S = 3/2 ions with a weak antiferromagnetic interchain interaction. In the ordered state, Tc, = 8.3 K, MnPc is a canted ferromagnet with easy axes of magnetization being along X1 and X3 directions. A zero-field splitting of the single ion 4A2 state of the manganese (II) ion gives rise to canted ferromagnetism which does not show complete saturation at the high field range of these experiments (50 kOe). The spin structure of manganese (II) phthalocyanine at low temperature is discussed. Author (GRA)

**N83-24384#** Stanford Univ., Calif. Solid State Electronics Lab.
**THE ELECTRICAL AND METALLURGICAL PROPERTIES OF DEFECTS IN COMPOUND SEMICONDUCTORS Final Report, 8 Feb. 1975 - 30 Sep. 1982**
Gerald L. Pearson Dec. 1982 13 p refs
(Contracts DAAG29-75-C-0013; DAAG29-78-C-0018)
(AD-A122902; ARO-12892.5-EL; ARO-15589.3-EL) Avail: NTIS HC A02/MF A01 CSCL 20/12

This report summarizes the research carried out under Contracts DAAG 29-75-0013 and DAAG 29-78-0018. The program on the contract was directed toward the following three separate projects related to the electrical, optical, and metallurgical properties of defects in compound semiconductors. GRA

**N83-24385#** Ames Lab., Iowa.
**SUPERCONDUCTIVITY AND LOW-TEMPERATURE PHASES OF Cu/ SUB X/Mo6Se8 Ph.D. Thesis**
Robert P. Doughterty Jul. 1982 53 p refs
(Contract W-7405-eng-82)
(DE83-004978; IS-T-1018) Avail: NTIS HC A04/MF A01

At room temperature, rhombohedral Cu/sub x/Mo6Se8 can exist for 0.0 less than or equal to x less than or equal to 3.0, but only samples with 1.0 less than or equal to x less than or equal to 2.8 were stabilized in the present investigations. Two phases with narrow homogeneity ranges of x form at low temperatures by distortion of the rhomohedral lattice: Cu2 Omo6Se8 forms at 1660K and has T/sub c/ = 1.10K; Cu/sub approx. 3.0/Mo6S38 forms at 1190K and has T/sub c/ = 2.790K. The equilibrium Cu concentrations of the low temperature phases increase with hydrostatic pressure. This gives rise to pressure-induced phase transitions, which were detected by measuring T as a function of pressure for several values of x. A pressure-composition phase diagram is given in Figure 17. The phase diagrams of Cu/sub x/Mo6S8 are qualitatively similar to those of Cu/sub x/Mo6Se8. The difference between the room temperature phase limits of the two systems is due to the lower valence of Se compared with S. DOE

**N83-24386#** California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
**LEED CRYSTALLOGRAPHY STUDIES OF THE STRUCTURE OF CLEAN AND ADSORBATE-COVERED Ir, Pt AND Rh CRYSTAL SURFACES Ph.D. Thesis**
Roland John Koestner Aug. 1982 415 p refs
(Contract DE-AC03-76SF-00098)
(DE83-004158; LBL-14766) Avail: NTIS HC A18/MF A01

A few Low Energy Electron Diffraction (LEE) intensity analyses were carried out to determine the structure of molecules adsorbed on metal surfaces; most surface crystallography studies concentrated on the structure of clean unreconstructed or atomic adsorbate-covered transition metal faces. The few molecular adsorption systems already investigated by dynamical LEED are CO on Ni(100), CU(100) and Pd(100) as well as C2H2 and C2H4 adsorbed on Pt(111). Research has been extended to the applicability of LEED crystallography to the more complicated unit cells found in molecular overlayers on transition metals or in their constructed surfaces of clean transition metals. DOE

**N83-24387#** Northeastern Univ., Boston, Mass. Dept. of Physics.
**DYNAMICAL FRICTION IN CONDENSED MATTER Progress Report, 15 Apr. - 15 Dec. 1982**
J. B. Sokoloff and C. H. Perry Dec. 1982 24 p refs Presented at the Am. Phys. Soc., Los Angeles, Mar. 1983
(Contract DE-AC02-81ER-10866)
(DE83-004338; DOE/ER-10866/2) Avail: NTIS HC A02/MF A01

We have performed molecular dynamical calculations on a model for sliding charge density waves interacting with impurities,

in order to understand the narrow band noise spectrum and metastability observed in niobium triselenate. We have also studied localization of electron and phonon states due to incommensurability in crystals containing two incommensurate periodic potentials such as crystals with charge density waves and ionic conductors. We are presently considering localization in the electron in a magnetic field and a periodic potential problem, which maps into the problem of an electron in two incommensurate periodic potentials discussed in the last sentence. IR, Raman, inelastic and quasi-elastic neutron scattering studies of ZrO2-Y2O3 have been measured on samples with 0,3,4,9,12,16, and 20 weight percent yttria have been completed as a function of temperature from 10 to 17,000 K. Their IR and Raman active frequencies, oscillator strengths and life-times have been obtained from the data. These studies also provided values for the temperature dependent oxygen-vacancy self diffusion constant, hopping times, activation energies and conductivites. The temperature and the static dielastic constant for cubic zirconia were measured from the neutron and IR data. Polarized IR and Raman light scattering studies of the one dimensional conductor hollandite K/sub 1.7/Mg/sub 0.85/Ti/sub 7.15/016 have been undertaken. Measurements have also been made down to 100 K and up to 10,000 K. DOE

**N83-24388#** California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
**TWO-DIMENSIONAL TRIANGULAR LATTICE AND ITS APPLICATION TO LITHIUM-INTERCALATED LAYERED COMPOUNDS Ph.D. Thesis**
Roberto Osorio deCerqueira Aug. 1982 105 p refs
(Contract DE-AC03-76SF-00098)
(DE82-021788; LBL-14815) Avail: NTIS HC A06/MF A01

Good rechargeable batteries are being searched for use in electric vehicles and in energy storage during off-peak consumption periods and from solar sources. The interest in lithium intercalation compounds has been recently enhanced by the search for such batteries. The process of intercalation of lithium in several transition metal dichalcogenides can provide an emf of several volts. The progress achieved in the last decade in the investigation of these intercalates has been facilitated by the availability of the dichalcogenides as single crystals and by their chemical stability. The transition-metal dichalcogenides and their Li-intercalates are studied, with emphasis on the Li/su xTa/sub yTi/sub l-y/S2 series. The interactions between the Li atoms and the applicability of a lattice gas model to the problem of ordering of these atoms is discussed. A formulation is presented of the cluster-variation aproximation to the lattice gas problem. The single-site and the nearest-neighbor triangle basic clusters are considered as models for Li/sub x TiS2. Also a theory is presented for the effects of a random distribution of different species of host atoms, as in Ta/sub y/Ti/sub l-y/S2. DOE

**N83-24389#** California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
**STRUCTURE AND PROPERTIES OF WSi-2 THIN FILMS FOR MOS DEVICES M.S. Thesis**
Li-Kuo Wu Jun. 1982 45 p refs
(Contract DE-AC03-76SF-00098)
(DE82-020293; LBL-14621) Avail: NTIS HC A03/MF A01

The annealing behaviors of coevaporated WSi2 on p-doped poly-Si were studied by X-ray diffraction, He(+)- backscattering, transmission electron microscopy, and Auger/SIMS analysis. High temperature annealing of silicide results in crystallization of what appears to be amorphous layers of tungsten silicide as well as diffusion of phosphorous out of the poly-Si. An attempt is made to correlate the physical and chemical properties with device fabrication and performance. DOE

**N83-24390#** Brookhaven National Lab., Upton, N. Y.
**RANDOM FIELDS AND ORDERING IN ANTIFERROMAGNETIC INSULATORS**
R. A. Cowley (Edinburgh Univ.) Aug. 1982 10 p refs Presented at the IUPAP Intern. Conf. on Magnetism, Kyoto, 6 Sep. 1982 Sponsored in part by the Atomic Energy of Canada Ltd. and the Canadian Science and Engineering Research Council
(Contract DE-AC02-76CH-00016)
(DE82-021566; BNL-31791; CONF-820929-4) Avail: NTIS HC A02/MF A01

Neutron scattering measurements of the effect on the long range order and phase transitions of random magnetic fields are reviewed. The results at low temperatures in Rb2Co/sub x/Zn/sub 1-x/F4 and Co/sub x/Zn/sub 1-x/F2 show that the long range order is not established when samples are cooled in a magnetic field, but they form a state with unusually long magnetic correlations. In Mn/sub x/Zn/sub 1-x/F2 a similar state is formed but only very close in temperature to T/sub N/. DOE

**N83-24391#** Massachusetts Univ., Amherst. Dept. of Mechanical Engineering.
**SYNTHESIS OF METASTABLE A-15 SUPERCONDUCTING COMPOUNDS BY ION IMPLANTATION AND ELECTRON-BEAM ANNEALING Technical Progress Report**
Mireille T. Clapp 1982 16 p refs
(Contract DE-AC02-80ER-10566)
(DE82-021627; DOE/ER-10566/T1; UM-5-28875) Avail: NTIS HC A02/MF A01

The effects are studied of high-dose implantation of B and C into Nb3Al alloys. This particular system was chosen because of its superconducting properties. Nb3Al has a-high superconducting transition temperature T/subc/ oc 18 K and has the A-15 structure. Most high T/subc/ materials seem to involve metastable materials and in particular metastable A-15's. There is empirical speculation that as the B atom in the A3B A-15 structure decreases in size, the transition temperature increased. This increase in T/subc/ appears to be associated with a decrease in lattice parameter and a rapprochement of the Nb atoms. An attempt is made to gradually replace the Al atoms by the smaller B and C atoms. Normal alloying of B and C with Nb3Al will make the A-15 structure unstable Ion implantation of B and C is a good approach for attempting to synthesize metastable A-15 Nb3A1/sub 1-x/B/sub x/ and Nb3A1/sub 1-x/Csubx/ (x=0to1). DOE

**N83-24392#** Stanford Univ., Calif. Dept. of Materials Science and Engineering.
**PHOTOELECTRONIC PROPERTIES OF ZINC PHOSPHIDE CRYSTALS, FILMS, AND HETEROJUNCTIONS Quarterly Progress Report, 1 Apr. - 30 Jun. 1982**
Richard H. Bube 1982 122 p refs
(Contract DE-AC02-77CH-00178)
(DE82-019282; SERI/PR-1202-1-T5; QR-13) Avail: NTIS HC A06/MF A01

The research on zinc phosphides is summarized and includes: ZnP2 materials preparation; electrical characterization of Zn3P2 crystals; characterization by low temperature photoluminescence, photoconductivity, Auger electron spectroscopy, and transmission electron microscopy; investigation of Zn3P2 based devices; and Zn3P2 films grown by close spaced vapor transport. An approach to future research on Zn3P2 is summarized and includes: chemical vapor transport growth with ZnCl2, ZnBr2, and ZnI2; an investigation of defect structure vs deviations from stoichiometry; growth and properties of (Zn3P2)/sub x/Cd3P2)/sub 1-x/ solid solutions; surface investigation on Zn3P2; investigation on Zn3P2; reactive metal junctions; and MIS structures on Zn3P2. Appended are two manuscripts, one on transport mechanisms for mg/Zn3P2 junctions and the other on properties of Zn3P2 crystals and devices. DOE

**N83-24393#** Oak Ridge National Lab., Tenn.
**BENCHMARKING OF EPITHERMAL METHODS IN THE LATTICE-PHYSICS CODE EPRI-CELL**
M. L. Williams, R. Q. Wright, J. Barhen, W. Rothenstein (Technion-Israel Inst. of Technology), and B. Toney 1982 38 p refs
(Contract W-7405-eng-26)
(DE82-017503; CONF-820566-5) Avail: NTIS HC A03/MF A01

The epithermal cross section shielding methods used in the lattice physics code EPRI-CELL (E-C) were extensively studied to

determine its major approximations and to examine the sensitivity of computed results to these approximations. Several improvements in the original methodology resulted. These include: treatment of the external moderator source with intermediate resonance (IR) theory, development of a new Dancoff factor expression to account for clad interactions, development of a new method for treating resonance interference, and application of a generalized least squares methods to compute best estimate values for the Bell factor and group dependent IR parameters. The modified E-C code with its new ENDF/B-V cross section library is tested for several numerical benchmark problems. DOE

**N83-24394#** Rocketdyne, Canoga Park, Calif. Energy Systems Group.

**CRYSTALLINE HOSTS TO ACCOMMODATE THE TRANSMUTATION OF Cs AND Sr**

E. R. Vance, R. Roy, J. Pepin, and D. K. Agrawal 23 Apr. 1982 16 p refs Prepared in cooperation with Pennsylvania State Univ., University Park

(Contract DE-AC09-79ET-41900)

(DE82-020264; DOE/ET-41900/10; ESG-DOE-13362) Avail: NTIS HC A02/MF A01

Certain deleterious effects on a solid nuclear waste form, though not yet quantitatively defined, could occur due to transmutations such as 137Cs+ yields 137 Ba2+ and 90Sr2+ yields 90Zr4+ (t sub /1/2/ = 30 yr in both cases). The relevant causes of such possible effects are the changes in ionic valence and size. This report explicitly formulates a chemical mitigation strategy: if the transmuting species can be incorporated in a multiple-cation host, in which one of the inert cations is a variable-valence transition metal, the valence change aspect of transmutation can be mitigated by a complementary valence change of the transition metal ion. The present work consisted of chemically simulating the transmutation, the goal being to find a Cs- and Sr-bearing single-phase host that would remain single-phase after the transmutation had occurred. Of several structures tried, perovskite appears to be the most promising, as the A-site can accommodate the approximately 20% size change that occurs when Cs decays to Ba. Ta and Nb were used as the variable-valence ions in the B site. Although not explicity studied here, magnetoplumbite seems likely to accommodate the Cs yields Ba transmutation. The application of the results to unpartitioned and partitioned nuclear wastes is discussed. DOE

**N83-24395#** Bendix Corp., Kansas City, Mo.

**EVALUATION OF SEMICONDUCTOR CHIPS FOR BENDIX-BUILT HYBRID MICROCIRCUITS Final Report**

T. A. Harger Sep. 1982 8 p

(Contract DE-AC04-76DP-00613)

(DE82-021307; BDX-613-2821) Avail: NTIS HC A02/MF A01

A process was established by which a representative cross section of the military-grade integrated circuit (IC) chips, procured from commercial suppliers for use in the production of telemetry hybrid microcircuits (HMCs), could be qualitatively assessed. This was accomplished by first packaging 10 representative groups of ICs using processes and tooling adapted from existing production applications. The groups were then preconditioned and electrically tested using existing product specifications, hardware, and software. These tasks were performed to determine the reliability of the published electrical characteristics of the devices at temperature extremes and through preconditioning. No formal acceptance testing is performed on the semiconductor chips procured for the telemetry HMCs at the component level. DOE

**N83-24396#** Sandia Labs., Albuquerque, N. Mex.

**MBE GROWTH AND CHARACTERIZATION OF InGaAs/ GaAs STRAINED-LAYER SUPERLATTICES**

I. J. Fritz, L. R. Dawson, G. C. Osbourn, P. L. Gourley, and R. M. Biefeld 1982 16 p refs Presented at the Intern. Symp. on GaAs and Related Compounds, Albuquerque, N. Mex., 20 Sep. 1982

(Contract DE-AC04-76DP-00789)

(DE82-022194; SAND-82-1296C; CONF-820960-3) Avail: NTIS HC A02/MF A01

The structural and electronic properties of MBE grown in/sub x/Ga/sub 1-x/As/GaAs (100) strained layer superlattices were investigated. These structures consist of alternating layers of In/sub x/Ga/sub 1-x/As (x approximately or = to 0.2) and GaAs in which the bulk lattice mismatch (approximately or = to 1.4%) is totally accommodated by coherent strains. The layer thicknesses (in the range 30 to 100 A) and layer compositions were verified by X-ray diffraction. Photocurrent and photoluminescence spectroscopic measurements were made to determine the position of the superlattice bandgap. The measured values are in good agreement with those predicted from theoretical calculations. DOE

**N83-24397#** Oak Ridge National Lab., Tenn.

**SUPERCONDUCTIVITY AND MAGNETISM IN TERNARY RARE-EARTH COMPOUNDS**

H. A. Mook, O. A. Pringle, S. Kawarazaki (Osaka Univ., Japan), S. K. Sinha (Argonne National Lab., Ill.), G. W. Crabtree (Argonne National Lab., Ill.), D. G. Hinks (Argonne National Lab., Ill.), M. B. Maple (California Univ., San Diego, La Jolla), Z. Fisk (California Univ., San Diego, La Jolla), D. C. Johnston (Exxon Research and Engineering Co., Linden, N.J.), and N. D. Woolf (California Univ., San Diego, La Jolla) Jul. 1982 17 p refs Presented at the 6th Yamada Conf. on Neutron Scattering of Condensed Matter, Tokyo, 1 Sep. 1982

(Contracts W-7405-eng-26; DE-AT03-76ER-70227; Grant NSF DMR-77-08469)

(DE82-022263; CONF-820935-4-Draft) Avail: NTIS HC A02/MF A01

Superconductivity and magnetism are two types of order that can take place in materials at low temperatures. When the magnetic order is ferromagnetic, a competition exists between magnetism and superconductivity. Neutron scattering has been used to measure the interaction of magnetism and superconductivity in a series of ternary rare earth alloys. A wide range of behavior is found near the magnetic transition, including mean-field magnetic ordering, first-order transitions between magnetism and superconductivity, and co-existence of ferromagnetism and superconductivity with a sinusoidally-modulated magnetic phase. DOE

**N83-24398#** Sandia Labs., Albuquerque, N. Mex. Fluid Mechanics and Heat Transfer Div.

**EFFECTIVE STRESS PRINCIPLE FOR PARTIALLY SATURATED GRANULAR MEDIA**

D. F. McTigue, R. K. Wilson, and J. W. Nunziato 1982 31 p refs Presented at the US-Japan Seminar on New Models and Constitutive Relations in the Mech. of Granular Mater., Ithaca, N.Y., 22 Aug. 1982

(Contract DE-AC04-76DP-00789)

(DE82-020408; SAND-82-1977C; CONF-820843-2) Avail: NTIS HC A03/MF A01

The fluid flow and matrix deformation in partially saturated media such as a soil or rock containing interstitial water and air is considered. Thermodynamic arguments are used to motivate the form of the interaction terms. As a result, a concept of effective stress emerges which agrees with previously proposed models and capillary effects are identified clearly in a thermodynamic context. The case of a linear elastic matrix is specialized and used to show how capillary suction reduces the porosity. The problem of one dimensional consolidation of a partially saturated half space in which the air is free to escape is considered. The problem for the fluid pressure reduces to a nonlinear diffusion problem, similar to that for the fluid pressure also indicate that the granular medium undergoes larger elastic deformation than in the saturated case. The effects of porosity gradients on consolidation are discussed. DOE

**N83-24399#** California Univ., San Diego.

**PHASE-SPACE ANALYSIS OF CONVECTION IN A 3He SUPERFLUID 4He SOLUTION**

Hans Haucke and Yoshiteru Maeno N. Mex. Los Alamos Scientific Lab. 1982 15 p refs Proc. of Order in Chaos Conf., Los Alamos, N. Mex., 24-28 May 1982

(Contract W-7405-eng-36)
(DE82-021773; LA-UR-82-2343; CONF-8205121-1) Avail: NTIS HC A02/MF A01

Observations were made on thermal convection below 1K in a dilute solution of He (3) in superfluid He (4) contained in a cylindrical cell of aspect ratio gamma = 1.20. Complicated oscillatory phenomena were observed with a high degree of reproducibility using two temperature sensors. Phase-space analysis suggests a description in terms of strange-attractor dynamics. DOE

**N83-24400#** Brookhaven National Lab., Upton, N. Y. National Synchrotron Light Source.
**OPTICAL DESIGN FOR THE NSLS CRYSTALLOGRAPHY BEAM LINE**
J. B. Hastings, P. Suortti (Helsinki Univ.), W. Thomlinson, A. Kvick, and T. F. Koetzle 1982 14 p refs Presented at Intern. Conf. on X-ray and VUV Synchrotron Radiation Instrumentation, Hamburg, West Germany, 9-13 Aug. 1982
(Contract DE-AC02-76CH-00016)
(DE83-000264; BNL-31855; CONF-820839-2) Avail: NTIS HC A02/MF A01

A photon beam well suited to accurate single crystal diffraction measurements, with particular attention to the possibilities of the use of anomalous dispersion is addressed. A beam uniform in intensity to 1% over an area 0.3 x 0.3 square mm, delta E/E is aproximately .0005, and tunable over the energy range 5 to 21 keV accessible from a NSLS bending magnet were determined. These criteria lead to a number of design decisions. A mirror is placed as the first optical element to better match the vertical opening angle of the photon beam to the typical rocking curves of low index silicon Bragg peaks, reducing delta E/E in a nondispersive, two crystal parallel mode monochromator with constant deviation. A post mirror to condense the radiation is placed after the monochromator. The entire optical system has been designed to operate in an ultra high vacuum environment. DOE

**N83-24401#** Sandia Labs., Albuquerque, N. Mex.
**ION-IMPLANTATION DAMAGE IN SILICATE GLASSES**
George W. Arnold 1982 6 p refs Presented at the 6th Intern. Symp. on the Sci. Basis for Radioactive Waste Management, Boston, 1 Nov. 1982
(Contract DE-AC04-76DP-00789)
(DE82-020964; SAND-82-1375C; CONF-821107-3) Avail: NTIS HC A02/MF A01

Ion implantation is a rapid technique for simulating damage induced by alpha recoil nuclei in nuclear waste forms. The simulation has been found to be quite good in TEM comparisons with natural alpha decay damage in minerals, but leach rate differences have been observed in glass studies and were attributed to dose rate differences. The similarities between ion implantation and recoil nuclei as a means of producing damage suggest that insights into the long term behavior of glass waste forms can be obtained by examination of what is known about ion implantation damage in silicate glasses. This paper briefly reviews these effects and shows that leaching results in certain nuclear waste glasses can be understood as resulting from plastic flow and track overlap. Phase separation is also seen to be a possible consequence of damage induced compositional changes. DOE

**N83-24402#** Nagpur Univ. (India). Dept. of Physics.
**THE 16TH NATIONAL SEMINAR ON CRYSTALLOGRAPHY: ABSTRACT OF PAPERS**
Mar. 1982 181 p refs Seminar held at Nagpur, India, 15-18 Mar. 1982 Sponsored in part by Indian National Science Academy, Maharashita Academy of Sciences, University Grants Commission and Department of Science and Technology
(PB83-135640) Avail: NTIS HC A09/MF A01 CSCL 07D

The abstracts of the papers received for this seminar are presented. These papers deal with the following subjects: Methods in Crystal Structure Analysis Including Computational Methods; Crystallography in Biology, Biohemistry, and Pharmacology; Atomic Scale Mechanisms, Physical Properties and Structures; Materials Science; Real and Ideal Crystals; Inorganic and Mineralogical Crystallography; Structures of Organic, Organic-Metallic Coordination Compounds and Polymers; Apparatus and Techniques; and Structural Methods Other Than Diffraction. GRA

# 77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

**N83-24403#** Oklahoma Univ., Norman. School of Chemical Engineering and Materials Science.
**APPLICATION OF MULTIPARAMETER CORRESPONDING STATES METHODS TO PREDICT THE THERMODYNAMIC PROPERTIES OF POLAR AND ASSOCIATING PURE COAL FLUIDS**
S. Watanasiri, K. H. Kumar, and K. E. Starling 1982 33 p refs Presented at Ann. Meeting of Heat and Energy Conversion, Los Angeles, 14 Nov. 1982
(Contract DE-FG22-80PC-30249)
(DE82-021544; CONF-821106-4) Avail: NTIS HC A03/MF A01

A multiparameter corresponding-states correlation was developed to accurately predict thermodynamic properties of nonpolar, polar, and associating compounds. The correlation parameters include critical temperature, critical density, structure factor, dipole moment, and three polar/associative parameters. The correlation was applied to predict vapor pressure, and density of a wide variety of polar and associating compounds including water, ammonia, alcohols, ethers, ketones, amines, mercaptans, cresols, xylenols, and indanols. The average absolute deviations for vapor pressure and density are 2.3% and 2.8%, respectively. DOE

# 80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

No abstracts in this category.

# 81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

**N83-24404#** Research Inst. of National Defence, Linkoeping (Sweden).
**AN APPROACH TO A PICTORIAL INFORMATION MANAGEMENT SYSTEM**
Jan-Olof Eklundh and Erland Jungert Nov. 1982 39 p refs
(FOA-C-30288-E1) Avail: NTIS HC A03/MF A01

The development of an information system containing map and image data is reported. Two issues are given particular stress. The first one concerns the input of map data in interpreted form into the computer. This goal is achieved by application of image processing techniques to the photographic (binary) overlays used in the map making. The second issue deals with the design of an object oriented information system, the objects being geographic entities with attributes. This system is built up as a Lisp-system on top of a relational database system. The present status of the project is reported together with an outline of future work. Author

**N83-24405#** Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.

**ANALYSIS OF DOD TRAVEL MANAGEMENT: AN APPLICATION OF LEARNING CURVE THEORY M.S. Thesis**
Silvia Signars Anderson and Robert F. McCauley Sep. 1982 241 p refs
(AD-A122865; AFIT-LSSR-72-82) Avail: NTIS HC A11/MF A01 CSCL 12/1

The recent Congressional interest in the DOD travel management program mandates improved methods of managerial control. This thesis applies learning curve theory, a traditional production planning tool, in forecasting 1983 discount fare usage at selected Scheduled Airline Traffic Office (SATO) locations. These projections may serve as criteria for comparison of future Travel Management Services Program (TMSP) test data. The authors cite the following potential benefits in learning curve applications to travel management: (1) improved cost control; (2) realistic goal establishment; (3) accurate cost prediction; and (4) improved budget estimation. The authors also provide a comparative analysis of the service differences between the enhanced SATO and the TMSP.
Author (GRA)

**N83-24406#** Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
**A DECISION SUPPORT SYSTEM FOR ACQUISITION OF F-16 AVIONICS INTERMEDIATE SHOP TEST SETS USING THE SYSTEM SCIENCE PARADIGM AND Q-GERT M.S. Thesis**
Gary C. Bryson, David J. Husby, and Michael E. Webb Sep. 1982 165 p refs
(AD-A123051; AFIT-LSSR-11-82) Avail: NTIS HC A08/MF A01 CSCL 01/3

Acquisition of support equipment is an integral part of initial logistics support for new weapons systems. However, uncertainty exists as to determining how much support equipment should be acquired to effectively and efficiently support a weapons system. Although many quantitative decision support tools have been developed to assist DOD logistics managers in determining the amount of support equipment required, the authors conclude that a modified F-111 test set utilization model, with contractor-provided engineering estimated parameters, was used to determine support equipment requirements for the F-16 aircraft. Using systems theory and queueing modeling to represent the F-16 LRU repair cycle process, the authors developed a Q-GERT simulation model to act as a decision support system for use in experimenting with varying quantities of F-16 AIS test sets. After statistical analysis of F-16 real world data and simulation results, the authors conclude that a Q-GERT simulation model can be used to represent the real world F-16 LRU repair cycle. In addition, two AIS test sets will statistically significantly reduce LRU awaiting maintenance times, but three will not. GRA

# 82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software.*

**N83-24407#** California Univ., Berkeley. Lawrence Berkeley Lab. Dept. of Computer Science and Mathematics.
**PROCEEDINGS OF THE SIXTH BERKELEY CONFERENCE ON DISTRIBUTED DATA MANAGEMENT AND COMPUTER NETWORKS**
1982 387 p refs Conf. held in Asilomar, Calif., 16-19 Feb. 1982 (Contract W-7405-eng-48)
(CONF-820201) Avail: NTIS HC A17/MF A01

A computer network distributed data bases, remote sites, protocols, distributed transactions, file maintenance, concurrency control, two phase locking, file system architecture, packet switched networks and performance analysis are discussed. For individual titles, see N83-24408 through N83-24424.

**N83-24408#** Syntrex, Inc., Eatontown, N.J.
**GEMINI: A RELIABLE LOCAL NETWORK**
Neil B. Cohen, Charles B. Haley, Scott E. Henderson, and Chak L. Won *In* LBL Proc. of the 6th Berkeley Conf. on Distributed Data Management and Computer Networks 1982 p 1-22 refs (For primary document see N83-24407 13-82)
Avail: NTIS HC A17/MF A01

A local network called Gemini was developed for word-processing terminals. Gemini's unique redundant architecture ensures that no single failure will keep the system from operating. The development of a distributed message switched operating system allowed the network to be easily constructed and expanded. Users can migrate to the network environment without being forced to learn new operating procedures, since the word-processing software that runs in a stand-alone terminal is the same software that runs on Gemini. Author

**N83-24409#** Rolm Corp., Santa Clara, Calif.
**THE RESILIENCY OF FULLY REPLICATED DISTRIBUTED DATABASES**
Wing Kai Cheng and Geneva G. Belford *In* LBL Proc. of the 6th Berkeley Conf. on Distributed Data Management and Computer Networks 1982 p 23-44 refs Prepared in cooperation with Illinois Univ., Urbana (For primary document see N83-24407 13-82)
Avail: NTIS HC A17/MF A01

An analysis of the availability of distributed database systems in relation to their update synchronization mechanisms and node availability is presented. Author

**N83-24410#** Stuttgart Univ. (West Germany). Inst. fuer Informatik.
**A ROBUST AND EFFICIENT PROTOCOL FOR CHECKING THE AVAILABILITY OF REMOTE SITES**
Bernd Walter *In* LBL Proc. of the 6th Berkeley Conf. on Distributed Data Management and Computer Networks 1982 p 45-68 refs (For primary document see N83-24407 13-82)
Avail: NTIS HC A17/MF A01

A robust and efficient protocol for checking the availability of remote sites is described. A remote site is said to be available if it has not crashed and if the communication facilities are able to transmit messages to and from this site. The presented protocol is robust against any number of site crashes and communication breakdowns including network partitioning. It is proven that the protocol is minimal in the given context. Some applications such as the recovery of multi-site-transactions are given. Author

**N83-24411#** Cornell Univ., Ithaca, N. Y. Dept. of Computer Science.
**A QUORUM-BASED COMMIT PROTOCOL**
Dale Skeen *In* LBL Proc. of the 6th Berkeley Conf. on Distributed Data Management and Computer Networks 1982 p 69-80 refs (For primary document see N83-24407 13-82)
Avail: NTIS HC A17/MF A01

A commit protocol and an associated recovery protocol that is resilient to site failures, lost messages, and network partitioning is proposed. The protocols do not require that a failure be correctly identified or even detected. The only potential effect of undetected failures is a degradation in performance. The protocols use a weighted voting scheme that supports an arbitrary degree of data replication (including none) and allows unilaterally aborts by any site. This last property facilitates the integration of these protocols with concurrency control protocols. Both protocols are centralized protocols with low message overhead. Author

**N83-24412#** Prime Computer, Inc., Framingham, Mass.
**IMPLEMENTATION OF DISTRIBUTED TRANSACTIONS**
Deborah J. DuBourdieu *In* LBL Proc. of the 6th Berkeley Conf. on Distributed Data Management and Computer Networks 1982 p 81-94 refs (For primary document see N83-24407 13-82)
Avail: NTIS HC A17/MF A01

Some of the issues encountered in the design and implementation of distributed transactions in an ongoing project are explored. An important feature of the concurrency control algorithm to be

discussed is that retrieval-only transactions never wait. Implementation details relevant to this feature include the maintenance of a pool of previous data images, and more complex synchronization requirements in a distributed environment. Another important point discussed is an optimization of the Two-Phase Commit protocol of an IPC suitable for support distributed transactions. Author

**N83-24413#** California Univ., Santa Barbara. Dept. of Computer Science.
**MUTUAL CONSISTENCY OF COPIES OF FILES BASED ON REQUEST CHARACTERISTICS**
Gautam Barua *In* LBL Proc. of the 6th Berkeley Conf. on Distributed Data Management and Computer Networks 1982 p 95-116 refs (For primary document see N83-24407 13-82)
(Grant NSF MCS-80-04257)
Avail: NTIS HC A17/MF A01

An algorithm to maintain mutual consistency of copies of a file in a distributed file system is presented. The number of up-to-date copies of a file varies according to the characteristics of the requests. When an update takes place, there is one such copy. As other nodes read, the number of copies grow till it again shrinks to one when another update takes place. An outline of a proof that the algorithm ensures mutual consistency and that there is no starvation of requests is presented. An informal discussion of the performance of the scheme is also presented. Author

**N83-24414#** Politecnico di Milano (Italy). Ist. di Elettrotecnica ed Elettronica.
**ON THE USE OF OPTIMISTIC METHODS FOR CONCURRENCY CONTROL IN DISTRIBUTED DATABASES**
Stefano Ceri and Susan Owicki *In* LBL Proc. of the 6th Berkeley Conf. on Distributed Data Management and Computer Networks 1982 p 117-130 refs Prepared in cooperation with Stanford Univ., Calif. (For primary document see N83-24407 13-82)
(Contract MDA903-79-C-0680)
Avail: NTIS HC A17/MF A01

Optimistic concurrency control methods are based on the assumption that, in most real-life applications, conflicts between transactions are unlikely. To exploit this, transactions are allowed to execute freely, without the overhead of complex consistency-preserving mechanisms. However, transactions are validated before making their actions visible to other processes, and they are backed up whenever their actions would lead to inconsistency. One of the optimistic concurrency control methods presented by Kung and Robinson for single-site systems provides the framework for the development of a concurrency control method for distributed databases. Distributed transactions have to satisfy the requirements imposed by the local concurrency control systems, and also to respect global consistency requirements. In particular, the notion of global serializability is introduced, and an algorithm which guarantees the global serializability of distributed transactions is presented. Author

**N83-24415#** Computer Corp. of America, Cambridge, Mass.
**PERFORMANCE OF TWO PHASE LOCKING**
Wen-Te K. Lin and Jerry Nolte *In* LBL Proc. of the 6th Berkeley Conf. on Distributed Data Management and Computer Networks 1982 p 131-160 refs (For primary document see N83-24407 13-82)
(Contract F30602-81-C-0028)
Avail: NTIS HC A17/MF A01

Simulation and analytical modeling of the two phase locking in a DBMS is the subject of this study. In the simulation model, the application environment is characterized by the transaction size -- the number of lockable units requested by each transaction -- and the system environment by the number of transactions running concurrently (multiprogramming level), total number of lockable units in the database, and the distribution of accesses to these lockable units. These environments are varied for different simulation runs. Output from these simulation runs includes the probabilities of a lock request involved in a conflict and deadlock respectively (PC and PD), and the average waiting delay (WT) and its standard deviation (DV) of a blocked lock request. Author

**N83-24416#** California Univ., Los Angeles.
**A DISTRIBUTED FILE SYSTEM ARCHITECTURE SUPPORTING HIGH AVAILABILITY**
D. Stott Parker and Raimundo A. Ramos *In* LBL Proc. of the 6th Berkeley Conf. on Distributed Data Management and Computer Networks 1982 p 161-184 refs Sponsored in part by BNDE and CAPES, Brazil (For primary document see N83-24407 13-82)
(Contract N00014-C-79-0866)
Avail: NTIS HC A17/MF A01

It is difficult to maintain redundant copies of resources such as files (in the interest of availability) while simultaneously keeping these copies mutually consistent when the network over which they are accessed is subject to partitioning. One approach is to sacrifice consistency during network partitions and reconcile inconsistent data later, when the network is repaired; this attitude was taken into the LOCUS system at UCLA. The version vector mechanism originally used to implement this approach is extended so as to detect inconsistency when more than one file is used by a transaction. The resulting general scheme is implemented in a way which gives the user a consistent view of system operation, even during network changes. Author

**N83-24417#** Harvard Univ., Cambridge, Mass. Computation Lab.
**SITE INITIALIZATION, RECOVERY, AND BACK-UP IN A DISTRIBUTED DATABASE SYSTEM**
Rony Attar, Philip A. Bernstein, and Nathan Goodman *In* LBL Proc. of the 6th Berkeley Conf. on Distributed Data Management and Computer Networks 1982 p 185-202 refs Sponsored in part by Chaim Weizmann Post-Doctoral Fellowships for Scientific Research (For primary document see N83-24407 13-82)
(Contracts N00014-80-C-0647; F30602-81-C-0028; Grant NSF MCS-79-07762)
Avail: NTIS HC A17/MF A01

Site selection is the problem of integrating a new site into a running distributed data base system (DDBS). Site recovery is the problem of integrating an old site into a DDBS when the site recovers from failure. Site backup is the problem of creating a static backup copy of a data base for archival or query purposes. An algorithm that solves the site initialization problem is presented. By modifying the algorithm slightly, solutions are presented to the other two problems was well. The algorithm exploits the fact that a correct DDBS must run a serializable concurrency control algorithm. The algorithm relies on the concurrency control algorithm to handle all intersite synchronization. Author

**N83-24418#** Computer Corp. of America, Cambridge, Mass.
**VIEW DEFINITION AND GENERALIZATION FOR DATABASE INTEGRATION IN MULTIBASE: A SYSTEM FOR HETEROGENEOUS DISTRIBUTED DATABASES**
Umeshwar Dayal and Hai-Yann Hwang (Texas Univ., Austin) *In* LBL Proc. of the 6th Berkeley Conf. on Distributed Data Management and Computer Networks 1982 p 203-238 refs (For primary document see N83-24407 13-82)
(Contract N00039-80-C-0402)
Avail: NTIS HC A17/MF A01

Access to a heterogeneous, distributed data base system can be simplified by providing users with a logically integrated interface or global view. There are two aspects to data base integration. Firstly, the local schemes may model objects and relationships differently and, secondly, the data bases may contain mutually inconsistent data. Several kinds of structural and data inconsistencies might exist. A versatile view definition facility for the Functional Data Model is described and illustrates the use of this facility for resolving inconsistencies. In particular, the concept of generalization is extended to this model, and its importance to data base integration is emphasized. The query modification algorithm for the relational model is extended to the semantically richer functional data model with generalization. Author

**N83-24419#** Pennsylvania State Univ., University Park. Dept. of Computer Science.
**SELECTIVE BROADCAST IN PACKET-SWITCHED NETWORKS**
David W. Wall *In* LBL Proc. of the 6th Berkeley Conf. on Distributed Data Management and Computer Networks 1982 p 239-258 refs (For primary document see N83-24407 13-82)
(Contract N00014-75-C-0601; Grant NSF MCS-81-02278)
Avail: NTIS HC A17/MF A01

Many researchers in the area of distributed networks have found it convenient to assume the existence of a facility for routing broadcast messages to all the nodes in a network, or selective broadcast messages to some subset of those nodes. However, relatively little work was done on the design of such a facility. A mechanism developed by Dalal was extended for total broadcast to the problem of selective broadcast, by converting an existing sequential algorithm on graphs into a distributed algorithm suitable for network use. Because of this approach, the results may provide some insight to the general problem of designing distributed algorithms. Author

**N83-24420#** Michigan State Univ., East Lansing. Dept. of Computer Science.
**PERFORMANCE ANALYSIS OF A SHORTEST-DELAY PROTOCOL**
Liang Li, Herman D. Hughes, and Lewis H. Greenberg *In* LBL Proc. of the 6th Berkeley Conf. on Distributed Data Management and Computer Networks 1982 p 259-282 refs (For primary document see N83-24407 13-82)
(Grant NSF PRM-81-15413)
Avail: NTIS HC A17/MF A01

A generalized shortest delay access method (SDAM) protocol for local networks is defined and evaluated. This protocol differs from a previously reported SDAM in that it accommodates a branching bus topology instead of a single bus network. It is shown that for small bus delays, SDAM performs very close to that of M/D/1--with perfect scheduling. The performance evaluation of SDAM is more pragmatic in that the effects of various protocol overheads (e.g., decoding, turnaround time, initializing packets, etc.) are taken into account. An analysis of the tradeoffs between exhaustive and nonexhaustive transmission disciplines is also presented. Author

**N83-24421#** Bell Telephone Labs., Inc., Piscataway, N. Y.
**THE BX.25 CERTIFICATION FACILITY**
J. A. Melici *In* LBL Proc. of the 6th Berkeley Conf. on Distributed Data Management and Computer Networks 1982 p 283-310 refs (For primary document see N83-24407 13-82)
Avail: NTIS HC A17/MF A01

BX.25 is a data communications protocol which was adopted as the standard protocol for host access to the Bell System's Operations System Network (OSN). BX.25 is based upon the Consultative Committee on International Telephone and Telegraph (CCITT) recommendation X.25. A facility is described to automatically test an implementation of BX.25 which conforms to the BX.25 specification. The facility, called the BX.25 Certification Facility (BCF), consists of a data base of tests, software to execute the tests, and a microprocessor dedicated to handling BX.25 communication. The output of the facility is a report which provides information concerning the degree to which an implementation conforms to the BX.25 specification. Author

**N83-24422#** Wisconsin Univ., Madison.
**THE DESIGN OF THE CSNET NAME SERVER**
Marvin Solomon, Lawrence H. Landweber, and Donald Neuhengen *In* LBL Proc. of the 6th Berkeley Conf. on Distributed Data Management and Computer Networks 1982 p 311-328 refs (For primary document see N83-24407 13-82)
Avail: NTIS HC A17/MF A01

CSNET is a new computer communications network being constructed that will link together University Computer Science departments and other groups doing computer science research in the United States. An important component of CSNET will be a directory service called the CSNET Name Server, which is implemented by a central data base at the University of Wisconsin and by software running at Wisconsin and on the computers of member institutions. The architecture of the name server facility is described. Author

**N83-24423#** IBM Watson Research Center, Yorktown Heights, N.Y.
**ON THE CORRECT AND EFFICIENT SCHEDULING OF TRANSACTIONS IN A HIGHLY PARALLEL DATABASE MACHINE**
Ravindran Krishnamurthy and Umeshwar Dayal (Computer Corp. of America) *In* LBL Proc. of the 6th Berkeley Conf. on Distributed Data Management and Computer Networks 1982 p 329-362 refs Prepared in cooperation with Texas Univ., Austin (For primary document see N83-24407 13-82)
Avail: NTIS HC A17/MF A01

A two step technique for producing correct and highly parallel schedules for MIMD, (multiple instruction stream, multiple data stream) data base machine is proposed. A parallel program schema model for transaction systems is presented. The concept of correct (i.e., serializable) executions existing in concurrency control theory for the sequential model is extended to this parallel model. The model is used to derive minimally constrained schemas for optimal scheduling. This constitutes the first step of the two step technique. In the second step, the transactions are partially interpreted enhance parallelism. A high level query language is chosen, for which a set of transaction modification rules are presented. A practical scheduling algorithm is proposed to obtain a highly parallel schema. Author

**N83-24424#** Illinois Univ., Chicago. Dept. of Information Engineering.
**PROMISING APPROACH TO DISTRIBUTED QUERY PROCESSING**
C. T. Yu, K. Lam, C. C. Chang, and S. K. Chang *In* LBL Proc. of the 6th Berkeley Conf. on Distributed Data Management and Computer Networks 1982 p 363-390 refs Sponsored in part by National Science and Engineering Research Council of Canada (For primary document see N83-24407 13-82)
(Contract MDA903-78-C-0293)
Avail: NTIS HC A17/MF A01

A distributed data base management system (DBMS) allows data to be stored at multiple locations and to be accessed as a single unified data base. A survey of problems with distributed DBMS and its advantages over a centralized data base is discussed. An important problem in distributed DBMS is to find an efficient strategy to process queries referencing data in different sites. Author

**N83-24425#** American Inst. of Physics, New York.
**STUDY OF PRESERVATION OF DOCUMENTS AT DEPARTMENT OF ENERGY LABORATORIES Final Report**
Joan N. Warnow, Allan Needell, Spencer R. Weart, and Jane Wolff Jan. 1982 77 p refs
(Contracts DE-AC02-78ER-05075; ER-78-C-02-5075)
(DE83-001210; DOE/ER-05075/14; COO-5075-14) Avail: NTIS HC A05/MF A01

Records management and appraisal are studied. The main report with summary information and with detailed recommendations and an appendix with detailed information on the elements of the project and its findings are included. DOE

**N83-24426#** Stoller (S. M.) Corp., Boulder, Colo.
**DATA-SYSTEMS QUANTITATIVE TECHNIQUES Final Report**
R. W. Keller, R. H. Koppe, E. A. Olson, and K. vanHowe Apr. 1982 564 p Sponsored by EPRI
(EPRI Proj. 1391-5)
(DE82-905755; EPRI-NP-2366) Avail: NTIS HC A24/MF A01

Analysis and decision processes were developed to enable the utility industry to derive maximum benefits from the evolving Information System for Generation Availability (ISGA). Four principal utility decision processes are defined: (1) design of a new unit; (2) existing unit improvement program; (3) adding new capacity to a generating system; and (4) defining research and development

programs. Each decision process is described by the types of decisions typically encountered. Options within the decision process are also described, along with the approach to manipulating major system and component data to provide a quantitative basis for decision making. DOE

# 83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

No abstracts in this category.

# 84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

**N83-24427#** Committee on Science and Technology (U. S. House).
**NATIONAL AERONAUTICS AND SPACE ADMINISTRATION AUTHORIZATION ACT, 1984**
Washington GPO 1983 14 p A bill referred to the Comm. on Sci. and Technol., 98th Congr., 1st Sess., 15 Apr. 1983
(H-Rept-98-65 purposes) Avail: US Capitol, House Document Room

Authorization of appropriations to the National Aeronautics and Space Administration for research and development, construction of facilities, research and program management, and other purposes was presented. Author

**N83-24428#** Committee on Energy and Natural Resources (U.S. Senate).
**WATER RESOURCE DEVELOPMENT BILLS**
Washington GPO 1982 169 p refs Hearing on S. 956, S. 1573, S. 1621 and S. 2177 before the Subcomm. on Water and Power of the Comm. on Energy and Natural Resources, 97th Congr., 2d Sess., 22 Apr. 1982
(GPO-95-462) Avail: Subcommittee on Water and Power

The water resource development bill deals with four areas of focus: the safety of reclamation dams, Lake Oswego's status as non-navigable replacement of existing pump casings in southern Nevada water pumping project, and construction of distribution and drainage facilities on non-Indian land on the Colorado River Basin. B.G.

**N83-24429#** Committee on Energy and Commerce (U. S. House).
**RESOURCE CONSERVATION AND RECOVERY ACT REAUTHORIZATION**
Washington GPO 1982 42 p Presented to the Comm. of the Whole House on the State of the Union, 97th Congr., 2d Sess., 18 May 1982
(H-Rept-97-570; GPO-89-081) Avail: US Capitol, House Document Room

Areas of concern discussed, included: state hazardous waste programs, resource conservation and recovery, hazardous waste site inventory, and recycled oil programs. B.G.

# 85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

**N83-24430** Department of Energy (UK), London (England). Technology Support Unit.
**PROSPECTS FOR IMPROVED FUEL ECONOMY AND FUEL FLEXIBILITY IN ROAD VEHICLES**
R. J. Francis and P. N. Woollacott Apr. 1981 119 p refs
(EP-45; ISBN-0-11-4109-5-X) Copyright. Avail: Issuing Activity

The various technical options for improving the fuel economy and fuel flexibility of road vehicles are examined. It assumes that present loads, passenger capacity and performance should be maintained, and it takes into account noise and emissions considerations. Author

**N83-24431*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
**CHARACTERIZATION OF A HIGH-PRESSURE DIESEL FUEL INJECTION SYSTEM AS A CONTROL TECHNOLOGY OPTION TO IMPROVE ENGINE PERFORMANCE AND REDUCE EXHAUST EMISSIONS Final Report**
John J. McFadden, Robert A. Dezelick, and Richard R. Barrows Mar. 1983 37 p refs
(Contract DE-AI01-80CS-50194)
(NASA-TM-83329; NAS 1.15:83329; DOE/NASA/50194-37) Avail: NTIS HC A03/MF A01 CSCL 13F

Test results from a high pressure electronically controlled fuel injection system are compared with a commercial mechanical injection system on a single cylinder, diesel test engine using an inlet boost pressure of 2.6:1. The electronic fuel injection system achieved high pressure by means of a fluid intensifier with peak injection pressures of 47 to 69 MPa. Reduced exhaust emissions were demonstrated with an increasing rate of injection followed by a fast cutoff of injection. The reduction in emissions is more responsive to the rate of injection and injection timing than to high peak injection pressure. Author

**N83-24432*#** South Coast Technology, Inc., Ann Arbor, Mich.
**ADVANCED HYBRID VEHICLE PROPULSION SYSTEM STUDY Final Report**
Robert Schwarz May 1982 330 p refs
(Contracts DEN3-93; DE-AI01-77CS-51044)
(NASA-CR-159773; NAS 1.26:159773; DOE/NASA/0093-1) Avail: NTIS HC A15/MF A01 CSCL 13F

Results are presented of a study of an advanced heat engine/electric automotive hybrid propulsion system. The system uses a rotary stratified charge engine and ac motor/controller in a parallel hybrid configuration. The three tasks of the study were (1) parametric studies involving five different vehicle types, (2) design trade-off studies to determine the influence of various vehicle and propulsion system paramaters on system performance fuel economy and cost, and (3) a conceptual design establishing feasibility at the selected approach. Energy consumption for the selected system was .034 1/km (61.3 mpg) for the heat engine and .221 kWh/km (.356 kWh/mi) for the electric power system over a modified J227 a schedule D driving cycle. Life cycle costs were 7.13 cents/km (11.5 cents/mi) at $2/gal gasoline and 7 cents/kWh electricity for 160,000 km (100,000 mi) life. Author

# 88 SPACE SCIENCES (GENERAL)

No abstracts in this category.

# 89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

**N83-24433*#** Louisiana State Univ., Baton Rouge. Dept. of Physics and Astronomy.

**SPECTRAL PHOTOMETRY OF EXTREME HELIUM STARS: ULTRAVIOLET FLUXES AND EFFECTIVE TEMPERATURE**
J. S. Drilling, D. Schoenberner, U. Heber (Kiel Univ.), and A. E. Lynas-Gray (University College, London) [1982] 29 p refs
(NASA-CR-170261; NAS 1.26:170261) Avail: NTIS HC A03/MF A01 CSCL 03A

Ultraviolet flux distributions are presented for the extremely helium rich stars BD +10 deg 2179, HD 124448, LSS 3378, BD -9 deg 4395, LSE 78, HD 160641, LSIV -1 deg 2, BD 1 deg 3438, HD 168476, MV Sgr, LS IV-14 deg 109 (CD -35 deg 11760), LSII +33 deg 5 and BD +1 deg 4381 (LSIV +2 deg 13) obtained with the International Ultraviolet Explorer (IUE). Broad band photometry and a newly computed grid of line blanketed model atmospheres were used to determine accurate angular diameters and total stellar fluxes. The resultant effective temperatures are in most cases in satisfactory agreement with those based on broad band photometry and/or high resolution spectroscopy in the visible. For two objects, LSII +33 deg 5 and LSE 78, disagreement was found between the IUE observations and broadband photometry: the colors predict temperatures around 20,000 K, whereas the UV spectra indicate much lower photospheric temperatures of 14,000 to 15,000 K. The new temperature scale for extreme helium stars extends to lower effective temperatures than that of Heber and Schoenberner (1981) and covers the range from 8,500 K to 32,000 K. Author

**N83-24434*#** Harvard Radio Astronomy Station, Fort Davis, Tex.
**SOLAR MAXIMUM MISSION: GROUND SUPPORT PROGRAMS AT THE HARVARD RADIO ASTRONOMY STATION Final Report**
Alan Maxwell 31 Mar. 1983 22 p refs
(Grant NsG-7648)
(NASA-CR-170267; NAS 1.26:170267) Avail: NTIS HC A02/MF A01 CSCL 03A

Observations of the spectral characteristics of solar radio bursts were made with new dynamic spectrum analyzers of high sensitivity and high reliability, over the frequency range 25-580 MHz. The observations also covered the maximum period of the current solar cycle and the period of international cooperative programs designated as the Solar Maximum Year. Radio data on shock waves generated by solar flares were combined with optical data on coronal transients, taken with equipment on the SMM and other satellites, and then incorporated into computer models for the outward passage of fast-mode MHD shocks through the solar corona. The MHD models are non-linear, time-dependent and for the most recent models, quasi-three-dimensional. They examine the global response of the corona for different types of input pulses (thermal, magnetic, etc.) and for different magnetic topologies (for example, open and closed fields). Data on coronal shocks and high-velocity material ejected from solar flares have been interpreted in terms of a model consisting of three main velocity regimes. Author

**N83-24435*#** Lick Observatory, Santa Cruz, Calif.
**OBSERVATIONS OF MAGNETIC FIELDS ON SOLAR-TYPE STARS**
Geoffrey W. Marcy (Mount Wilson Observatory, Pasadena, Calif.) [1982] 73 p refs
(Grant NsG-8407)
(NASA-CR-170296; NAS 1.26:170296) Avail: NTIS HC A04/MF A01 CSCL 03A

Magnetic-field observations were carried out for 29 G and K main-sequence stars. The area covering-factors of magnetic regions tends to be greater in the K dwarfs than in the G dwarfs. However, no spectral-type dependence is found for the field strengths, contrary to predictions that pressure equilibrium with the ambient photospheric gas pressure would determine the surface field strengths. Coronal soft X-ray fluxes from the G and K dwarfs correlate well with the fraction of the stellar surface covered by magnetic regions. The dependence of coronal soft X-ray fluxes on photospheric field strengths is consistent with Stein's predicted generation-rates for Alfven waves. These dependences are inconsistent with the one dynamo model for which a specific prediction is offered. Finally, time variability of magnetic fields is seen on the two active stars that have been extensively monitored. Significant changes in magnetic fields are seen to occur on timscales as short as one day. Author

**N83-24436*#** Chicago Univ., Ill. Dept. of Astronomy and Astrophysics.
**THE DETERMINATION OF CLOUD MASSES AND DUST CHARACTERISTICS FROM SUBMILLIMETRE THERMAL EMISSION**
Roger H. Hildebrand Apr. 1983 36 p refs Submitted for publication
(Grants NsG-2057; NSF AST-81-17134)
(NASA-TM-84356; A-9313; NAS 1.15:84356; PREPRINT-9) Avail: NTIS HC A03/MF A01 CSCL 03A

The principles by which the dust and masses and total masses of interstellar clouds and certain characteristics of interstellar dust grains can be derived from observations of far infrared and submillimeter thermal emission are reviewed. To the extent possible, the discussion will be independent of particular grain models. S.L.

**N83-24437*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
**THE GALAXY'S 157 MICRON (C 2) EMISSION: OBSERVATIONS BY MEANS OF A SPECTROSCOPIC LUNAR-OCCULTATION TECHNIQUE**
Gordon J. Stacey, Scott D. Smyers, Noel T. Kurtz, and Martin Harwit Apr. 1983 21 p refs Submitted for publication Prepared in cooperation with Cornell Univ., Ithaca, N.Y.
(Grant NGR-33-010-146)
(NASA-TM-84355; NAS 1.15:84355; A-9312) Avail: NTIS HC A02/MF A01 CSCL 03A

Galactic (C II) 157 micron, fine-structure emission was estimated. At a Galactic longitude of 8 deg, the peak power observed in a 7' x 7' field is approx. 5 x 10 to the -9 Watt. The method used to detect this radiation involved chopping against the cold side of the Moon. Author

**N83-24438#** Eastern Enterprises, Boulder, Colo.
**A TWO-POINT CORRELATION STUDY OF INTERPLANETARY CONDITIONS AS OBSERVED BY PIONEER 12 AND IMP 8 Final Report**
Tyan Yeh Feb. 1982 34 p refs
(Contracts NOAA-NA80RA-C-00103; NOAA-NA81RA-A-01021)
(AFGL-TR-82-0073) Avail: NTIS HC A03/MF A01

Correlations of interplanetary conditions at two interplanetary points are examined. Indirect comparisons are made between the observational data obtained by the Venus bound space probe, Pioneer 12, and the Earth bound satellite, IMP 8. The correspondence between the data points in the two sets of data is established by the assumption that solar wind streams corotate with the Sun. The streaming plasma in each stream tube is assumed to have a stationary profile under the effects of thermal conduction and solar gravitation. Author

**N83-24439#** Cambridge Univ. (England). Inst. of Astronomy.
**[ACTIVITIES REPORT OF THE INSTITUTE OF ASTRONOMY] Annual Report, 1981-1982**
1982 41 p refs
Avail: NTIS HC A03/MF A01

The evolution of single and binary stars. Cool binaries (principally W UMa and RS Vn binaries), and cataclysmic binaries were reviewed. The secular evolution of the latter probably involves angular momentum loss via stellar winds, but it is by no means clear how this evolutionary mechanism can explain the rather significant shortages of white dwarf/red dwarf binaries with periods of 2 to 3 hours (the gap) and of less than 1.3 hours (the cutoff). Tidal friction is important not only as a mechanism for enforcing synchronism as a system loses singular momentum, but also as a mechanism for heating 'black dwarf' companions (less than or

approximately 0.1 solar mass) so that they are never found at periods below the cutoff. Other mechanisms such as gravitational radiation alone cannot explain the cutoff, even though they may appear to, because they do not prevent low mass detached companions from violating the cutoff; they also fail to explain the gap. As an aid to calculating semidetached evolution, Roche lobe effective radii were computed carefully, and found to fit the formula. Author

**N83-24440#** Los Alamos Scientific Lab., N. Mex.
**RADIAL AND NONRADIAL PERIODS OF DELTA SCUTI**
S. P. Clancy and A. N. Cox 1982 6 p refs Presented at Conf. on Pulsations in Classical and Cataclysmic Variable Stars, Boulder, Colo., 1 Jun. 1982
(Contract W-7405-eng-36)
(DE82-021770; LA-UR-82-2333; CONF-8206101-9) Avail: NTIS HC A02/MF A01

Five periods for the prototype variable star delta Scuti were discussed. The main one, at 0.193772 day, was identified as the radial fundamental mode. The others are clearly understood, but the second radial overtone is probably the correct identification for the 0.116366 day period. The other three at 0.186891, 0.189435, and 0.211157 day seem to be nonradial modes because of their long periods. The first of these seems to have 1 = 2 amd m = 2. Table 1 gives these observed periods. Based on nonradial pulsation constants, the 4.48 hour (.187 day) period seems to be a p sub 1 mode. A nonradial nonadiabatic computing program is used to predict periods in this range for a model matching the observed parameters of delta Scuti and to identify all five periods. DOE

**N83-24441#** Los Alamos Scientific Lab., N. Mex.
**APPLICATION OF TWO-TIME METHODS IN STELLAR PULSATIONS**
W. Dean Pennell, Oded Regev (Florida Univ., Gainesville), and J. Robert Buchler (Florida Univ., Gainesville) 28 Jul. 1982 6 p refs Presented at the Conf. on Pulsations in Classical and Cataclysmic Variables, Boulder, Colo., 1-4 Jun. 1982
(Contract W-7405-eng-36; Grant NSF AST-81-16777)
(DE82-021924; LA-UR-82-2302; CONF-8206101-4) Avail: NTIS HC A02/MF A01

The method of two time expansions is extended to include the effects of the outer, nonadiabatic layers in stellar pulsation. The evolution of pulsating stellar models can be examined, including the approach to limit cycle behavior. The method is demonstrated by a calculation of the eigenvectors for a beta Cepheid model. It is argued that the method is promising as a practical tool for treating the approach to limiting oscillations, as well as resonant and multimode behavior. DOE

# 90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

**N83-24442*#** City Coll. of the City Univ. of New York. Dept. of Physics.
**THEORETICAL PROBLEMS OF SPIRAL GALAXIES Final Technical Report, 1 Nov. 1978 - 30 Jun. 1982**
Chi Yuan [1982] 11 p
(Grant NsG-2348)
(NASA-CR-170232; NAS 1.26:170232) Avail: NTIS HC A02/MF A01 CSCL 03B

Three theoretical problems concerning the large scale structure of disk galaxies in general, and the Milky Way System, in particular, were proposed to study. They are, namely, modes of spiral density waves, evolutionary change of the abundance distribution of the gas in the Milky Way System and the motions of the cloud medium behind the large scale galactic shock. Author

**N83-24443*#** City Coll. of the City Univ. of New York. Dept. of Physics.
**ON THE LOCAL STANDARD OF REST**
C. Yuan [1982] 6 p refs
(Grant NsG-2348)
(NASA-CR-170238; NAS 1.26:170238) Avail: NTIS HC A02/MF A01 CSCL 03B

Under the influence of a spiral gravitational field, there should be differences among the mean motions of different types of objects with different dispersion velocities in a sipral galaxy. The old stars with high dispersion velocity should have essentially no mean motion normal to the galactic rotation. On the other hand, young objects and interstellar gas may be moving relative to the old stars at a velocity of a few kilometer per second in both the radial (galacto-centric), and circular directions, depending on the spiral model adopted. Such a velocity is usually referred as the systematic motion or the streaming motion. The conventionally adopted local standard of rest is indeed co-moving with the young objects of the solar vicinity. Therefore, it has a net systematic motion with respect to the circular motion of an equilibrium galactic model, defined by the old stars. Author

**N83-24444#** Academy of Sciences (USSR), Moscow. Keldysh Inst. of Appl. Math.
**SPACE CORRELATION FUNCTION OF RICH CLUSTERS OF GALAXIES**
A. A. Klypin and A. I. Kopylov 1982 18 p refs In RUSSIAN; ENGLISH summary
(TM-77230) Avail: NTIS HC A02/MF A01

The space correlation function of Abell cluster of galaxies is approximated by the power law. Observational results on red shift determinations of rich clusters are given. Possible explanations of the found correlation function are discussed. The apparent difference between clusters and galaxies lead to some theoretical difficulty and probably means that there exists a preferable scale of clustering. Author

**N83-24445*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
**THE RELATIONSHIP BETWEEN SATURN KILOMETRIC RADIATION AND THE SOLAR WIND**
M. D. Desch and H. O. Rucker Mar. 1983 22 p refs
(NASA-TM-85004; NAS 1.15:85004) Avail: NTIS HC A02/MF A01 CSCL 03B

Voyager spacecraft radio, interplanetary plasma, and interplanetary magnetic field data are used to show that large amplitude fluctuations in the power generated by the Saturn kilometric radio emission are best correlated with solar wind ram pressure variation. In all, thirteen solar wind quantities previously found important in driving terrestrial magnetospheric substorms and other auroral processes were examined for evidence of correlations with the Saturn radio emission. The results are consistent with hydromagnetic wave or eddy diffusion processes driven by large scale solar wind pressure changes at Saturn's dayside magnetopause. Author

**N83-24446#** Kiel Univ. (West Germany). Inst. fuer Reine und Angewandte Kernphysik.
**COMMENTS ON THE QUESTION OF MERCURY'S PERIHELIAL MOTION [ERGAE NZENDE BEMERKUNGEN ZUR FRAGE DER PERIHELBEWEGUNG DES MERKUR]**
Erich R. Bagge 1 Mar. 1982 21 p In GERMAN
(IFKKI-82/1) Avail: NTIS HC A02/MF A01

The numerical integration of the Newtonian movement equations which give values on the perihelial movement of the planet Mercury and remain unchanged at improved intervals in the integration intervals is shown. The calculations consider the relativistic velocity dependence in the mass and in the acceleration area and in the gravitation force. The calculations are compared with the independent programs in cartesian and polarity coordinates. Transl. by E.A.K.

**N83-24447#** Ruhr Univ., Bochum (West Germany). Bereich Extraterrestrische Physik.
**DYNAMICS, POWER BUDGET, AND OPTICAL SCATTERING**

**PROPERTIES OF INTERPLANETARY DUST PARTICLES: RESULTS OF THE INTERPRETATION OF THE HELIOS DATA (E 10 Z) Final Report, Jun. 1982**

Richard-Heinrich Giese, Tadashi Mukai, Maria Rohde, Dieter Schmidt, Herbert Schwehm, Karin Weiss, and Hartmut Zerull Bonn Bundesministerium fuer Forschung und Technologie Dec. 1982 156 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-W-82-027; ISSN-0170-1339) Avail: NTIS HC A08/MF A01; Fachinformationszentrum, Karlsruhe, West Ger. DM 32

Results of the Micrometeoroid Detector and Zodiacal Light Experiment published or directly provided by the Helios-Investigators were used in an effort of cooperative interpretation. Analysis of orbital elements derived from impacts led to low inclination orbits for larger and mainly hyperbolic trajectories of smaller micrometeorites, both with negligible percentage of retrograde cases. Radiation pressure, energy budget, and the orbits of dust particles evaporating near the Sun were investigated, taking into account the effects of size variation. It was found, that there is no appreciable production of Beta-meteoroids by evaporation, since in most cases this effect leads to total destruction faster than the particle can escape by radiation pressure. Scattering properties of irregular, fluffy and meteoritic particles were investigated by calculations, microwave and laser scattering experiments. Author

**N83-24448#** California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.

**CALIBRATION OF A PHOTOMETER FOR MEASUREMENT OF THE COSMIC-MICROWAVE BACKGROUND**

J. L. Bonomo, J. B. Peterson, P. L. Richards, and T. Timusk (McMaster Univ.) Jul. 1982 25 p refs Presented at the Gamow Cosmology Summer School, Varenna, Italy, 13 Jul. 1982

(Contract DE-AC03-76SF-00098)

(DE83-001361; LBL-14739; CONF-820752-1) Avail: NTIS HC A02/MF A01

The calibration of a photometer designed to measure the cosmic microwave background radiation in the frequency range from 3 to 10 cm is described. The general problem of absolute calibration for such measurements is discussed. The design of a new experiment which is different in most important respects from the Woody-Richards experiment is then presented. A mathematical model of the calibration procedure is developed which includes an analysis of ways in which the procedure can fail to give accurate results. DOE

**N83-24449#** Los Alamos Scientific Lab., N. Mex. Theoretical Div.

**LINEAR THEORY RADIAL AND NONRADIAL PULSATIONS OF DA DWARF STARS**

Sumner Starrfield (Arizona State Univ.), Arthur N. Cox, Stephen Hodson, and W. D. Pesnell (Florida Univ.) 28 Jul. 1982 6 p refs Presented at the Conf. on Pulsations in Classical and Cataclysmic Variable Stars, Boulder, Colo., 1-5 Jun. 1982

(Contract W-7405-eng-36)

(DE82-021777; LA-UR-82-2349; CONF-8206101-6) Avail: NTIS HC A02/MF A01

The stellar envelope and radial linear nonadiabatic computer code, along with a nonradial code are used to investigate the total hydrogen mass necessary to produce the nonradial instability of DA dwarfs. Opacities and equations of state are obtained for pure mixtures of hydrogen, helium, and carbon. In some cases, a small amount of metals are included in the composition in order to have a variety of mixtures available to make gradual changes in composition from hydrogen to helium. The presence of metals in these mixtures has no effect on the results. Author

# 91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights. For spacecraft design see *18 Spacecraft Design Testing, and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

**N83-24450*#** Southwest Research Inst., San Antonio, Tex.

**THREE DIMENSIONAL RAY TRACING JOVIAN MAGNETOSPHERE IN THE LOW FREQUENCY RANGE Final Report**

J. D. Menietti Oct. 1982 50 p refs

(Contracts NAS7-100; JPL-956026)

(NASA-CR-170237; JPL-9950-801; NAS 1.26:170237) Avail: NTIS HC A03/MF A01 CSCL 03B

Ray tracing of the Jovian magnetosphere in the low frequency range (1+40 MHz) has resulted in a new understanding of the source mechanism for Io dependent decametric radiation (DAM). Our three dimensional ray tracing computer code has provided model DAM arcs at 10 deg. intervals of Io longitude source positions for the full 360 deg of Jovian system III longitude. In addition, particularly interesting arcs were singled out for detailed study and modelling. Dependent decametric radiation arcs are categorized according to curvature--the higher curvature arcs are apparently due to wave stimulation at a nonconstant wave normal angle, psi. The psi(f) relationship has a signature that is common to most of the higher curvature arcs. The low curvature arcs, on the other hand, are adequately modelled with a constant wave normal angle of close to 90 deg. These results imply that for higher curvature arcs observed for from Jupiter (to diminish spacecraft motion effects) the electrons providing the gyroemission are relativistically beamed. Author

**N83-24451*#** California Univ., Los Angeles. Dept. of Chemistry and Biochemistry.

**HIGH PRESSURE COSMOCHEMISTRY APPLIED TO MAJOR PLANETARY INTERIORS: EXPERIMENTAL STUDIES**

Malcolm F. Nicol, Mary Johnson, and Andrea Schwake 1 May 1983 5 p refs

(Grant NAGw-104)

(NASA-CR-170303; NAS 1.26:170303) Avail: NTIS HC A02/MF A01 CSCL 03B

The infrared spectra of H2O ice VII and D2O ice VII were studied and techniques were developed for measuring adiabats of phases of NH3-H2O to 5 GPa. A mixing system for pressurized fluids was constructed in which liquid solutions of definite compositions can be prepared and loaded reliably into diamond cells in a project which seeks to determine the properties and boundaries of several high pressure phases of the H2-He-H2O-NH3-CH4 system. These data are needed to constrain theoretical models of the interiors of the major planets. A.R.H.

# 92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

**N83-24452*#** Hawaii Univ., Honolulu. Inst. for Astronomy.

**CORONAL AND CHROMOSPHERIC PHYSICS Semiannual Status Report, 1 Nov. 1982 - 30 Apr. 1983**

John T. Jefferies, Donald A. Landman, and Frank Q. Orrall 2 May 1983 25 p refs

(Grant NGL-12-001-011)

(NASA-CR-170295; NAS 1.26:170295) Avail: NTIS HC A02/MF A01 CSCL 03B

Achievements and completed results are discussed for investigations covering solar activity during the solar maximum mission and the solar maximum year; other studies of solar activity and variability; infrared and submillimeter photometry; solar-related atomic physics; coronal and transition region studies; prominence

research; chromospheric research in quiet and active regions; solar dynamics; eclipse studies; and polarimetry and magnetic field measurements. Contributions were also made in defining the photometric filterograph instrument for the solar optical telescope, designing the combined filter spectrograph, and in expressing the scientific aims and implementation of the solar corona diagnostic mission. A.R.H.

**N83-24453*#** Weber State Coll., Ogden, Utah. Dept. of Physics.
**MASS FLOW VELOCITY DISTRIBUTION IN THE SOLAR CHROMOSPHERE Final Report, 1 Jan. 1980 - 31 Sep. 1981**
David A. Tripp 31 Sep. 1981 14 p refs
(Grant NAGw-19)
(NASA-CR-170744; NAS 1.26:170744) Avail: NTIS HC A02/MF A01 CSCL 03B

A study of chromospheric lines (those of Si-II and Si-III) was made using the data from high resolution telescope and spectrograph (HRTS). The optically thick line profiles such as lambda 1206 due to Si-III and lambda 1265 and lambda 1533 due to Si-II were to be investigated in detail using the techniques of spectrum synthesis in an attempt to model the mass flow velocity distribution in the region of the solar atmosphere. Author

**N83-24454*#** American Science and Engineering, Inc., Cambridge, Mass.
**AN INVESTIGATION OF CORONAL ACTIVE REGION LOOP STRUCTURES USING AS&E ROCKET X-RAY IMAGES Final Report, 31 Mar. 1982 - 31 Mar. 1983**
David F. Webb Apr. 1983 100 p refs
(Contract NASw-3586)
(NASA-CR-170284; NAS 1.26:170284; ASE-4792) Avail: NTIS HC A05/MF A01 CSCL 03B

Simultaneous high spatial resolution observations at 6 cm in soft X-rays, in photospheric magnetograms, and in optical filtergrams were used to compare the most intense sources of centimetric emission in two active regions to coronal loops, sunspots, chromospheric structures, and photospheric magnetic fields. Results show that the majority of the bright microwave components are not associated with sunspots or X-ray emission. A nonthermal mechanism appears necessary to explain the brightest microwave components, discrete regions of continuous particle acceleration may be common in active regions. Studies of the plasma parameters of selected loops imply that the radio emission is consistent with gyro-resonance absorption at the third and fourth harmonic, at least from part of each loop. Results are presented for: (1) X-ray and microwave observations of active regions; (2) comparison of coronal holes observed in soft X-rays and HeI 10830 A spectrosheliograms; and (3) the reappearance of polar coronal holes and the evolution of the solar magnetic field. A.R.H.

**N83-24455*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
**THE HARD X-RAY BURST SPECTROMETER EVENT LISTING 1980, 1981 AND 1982**
Brian R. Dennis, Kenneth J. Frost, Larry E. Orwig, Alan Kiplinger (Applied Research Corp., Annapolis), Harold E. Dennis (Computer Sciences Corp., Silver Spring, Md.), Bernard R. Gibson (Computer Sciences Corp., Silver Spring, Md.), G. Shelby Kennard (Computer Sciences Corp., Silver Spring, Md.), and A. Kimberley Tolbert (Computer Sciences Corp., Silver Spring, Md.) Mar. 1983 143 p refs
(NASA-TM-84998; NAS 1.15:84998) Avail: NTIS HC A07/MF A01 CSCL 03B

A comprehensive reference for the hard X-ray bursts detected with the Hard X-Ray Burst Spectrometer on the Solar Maximum Mission for the time of launch on February 14, 1980 to March 1983 is provided. Over 6300 X-ray events were detected in the energy range from 30 to approx 500 keV with the vast majority being solar flares. The listing includes the start time, peak time, duration and peak rate of each event. Author

**N83-24456#** National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.
**SOLAR-GEOPHYSICAL DATA NUMBER 455, JULY 1982. PART 1: (PROMPT REPORTS). DATA FOR JUNE 1982, MAY 1982 AND LATE DATA**
Helen E. Coffey Jun. 1982 179 p refs
(PB83-120329; SGD-455-Pt-1; NOAA-82091603-Pt-1) Avail: NTIS HC A09/MF A01 CSCL 03B

Maps and tables of data are given on the following: alert periods; daily solar indices; solar flares; solar radio emission; solar wind measurements; coronal holes; inferred interplanetary magnetic field polarities; mean solar magnetic field; daily solar activity centers; sudden ionospheric disturbances; cosmic rays; geomagnetic indices; and radio propagation indices. GRA

**N83-24457#** Bern Univ. (Switzerland). Div. of Solar Observations.
**BERNE SOLAR OBSERVATIONS. SOLAR DATA FOR JULY - DECEMBER 1982**
M. Fuhrer, N. Kaempfer, A. Magun, W. Schoehlin, M. Staehli, and J.-P. Wuelser Jan. 1983 38 p
(Rept-49) Avail: NTIS HC A03/MF A01

Solar flare observation data at H-alpha and solar radio observations are presented. B.G.

**N83-24458#** National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.
**SOLAR-GEOPHYSICAL DATA NUMBER 457, SEPTEMBER 1982. PART 1: (PROMPT REPORTS). DATA FOR AUGUST 1982, JULY 1982 AND LATE DATA**
Helen E. Coffey Sep. 1982 186 p 2 Vol.
(PB83-137752; SGD-457-Pt-1; NOAA-82110402) Avail: NTIS HC A09/MF A01 CSCL 03B

Data is given in the form of tables and maps for the following topics: alert periods; daily solar indices; solar flares; solar radio emission; spacecraft observations; inferred interplanetary magnetic field polarities; mean solar magnetic field; geomagnetic; daily solar activity centers; sudden ionospheric disturbances; cosmic rays; geomagnetic indices; and radio propagation indices. GRA

**N83-24459#** National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.
**SOLAR-GEOPHYSICAL DATA NUMBER 457, SEPTEMBER 1982. PART 2: (COMPREHENSIVE REPORTS). DATA FOR MARCH 1982, MAY 1980 AND MISCELLANEA**
Helen E. Coffey Sep. 1982 129 p 2 Vol.
(PB83-137760; SGD-457-Pt-2) Avail: NTIS HC A07/MF A01 CSCL 03B

Tables of data are given on the following topics: solar radio emission; energetic solar particles and plasma; solar X-ray radiation; mass ejections from the Sun; and solar flares. GRA

**N83-24460#** National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.
**SOLAR-GEOPHYSICAL DATA 456, AUGUST 1982. PART 1: (PROMPT REPORTS). DATA FOR JULY 1982, JUNE 1982 AND LATE DATA**
Helen E. Coffey Aug. 1982 165 p 2 Vol.
(PB83-138222; SGD-456-Pt-1; NOAA-82102601) Avail: NTIS HC A08/MF A01 CSCL 03B

Tables of data on alert periods, daily solar indices, solar flares, solar adio emission, spacecraft observations, inferred interplanetary magnetic field polarities, and the solar magnetic field are given. GRA

**N83-24461#** National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.
**SOLAR-GEOPHYSICAL DATA NUMBER 456, AUGUST 1982. PART 2: (COMPREHENSIVE REPORTS). DATA FOR FEBRUARY 1982 AND MISCELLANEA**
Helen E. Coffey Aug. 1982 92 p refs 2 Vol.
(PB83-138230; SGD-456-Pt-2; NOAA-82102602) Avail: NTIS HC A05/MF A01 CSCL 03B

Tables of data on solar radio emission, solar X-ray radiation, and mass ejections from the Sun are given. GRA

**N83-24462#** National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.
**SOLAR-GEOPHYSICAL DATA NUMBER 455, JULY 1982. PART 2: (COMPREHENSIVE REPORTS). DATA FOR JANUARY 1982 AND MISCELLANIES**
Helen E. Coffey Jul. 1982 43 p refs
(PB83-120311; SGD-455-Pt-2; NOAA-82091604-Pt-2) Avail: NTIS HC A03/MF A01 CSCL 03B

Solar radio emission and solar X-ray radiation data are presented. Mass ejections from the Sun active regions and synoptic solar maps are included. GRA

# 93 SPACE RADIATION

Includes cosmic radiation; and inner and outer Earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

**N83-24463*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
**SEARCHES FOR GAMMA RAY EMISSION FROM RADIO PULSARS**
D. J. Thompson, D. L. Bertsch, R. C. Hartman, and S. D. Hunter Jan. 1983 20 p refs
(NASA-TM-84970; NAS 1.15:84970) Avail: NTIS HC A02/MF A01 CSCL 03B

Searches were made for pulsed high energy ($E > 35$ MeV) gamma radiation from 43 pulsars using the SAS-2 data base and radio parameters. No positive results were found, and the upper limits are consistent with the concept that gamma ray production efficiency increases with increasing apparent age. Two limits suggest that efficiency cannot be a simple function of apparent age beyond 10,000,000 years. S.L.

# 99 GENERAL

**N83-24464#** Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
**DEVELOPMENTS IN SCIENCE AND TECHNOLOGY Annual Report, 1981**
1981 192 p refs
(Contract N00024-83-C-5301)
(AD-A125288; JHU/APL-DST-9) Avail: NTIS HC A09/MF A01 CSCL 05/1

Accounts of the Laboratory's significant work are compiled. The areas covered include radar surveillance and tracking systems; weapon control systems; battle group control systems; weapons technology; space science and technology; ocean science and technology; computer technology applications; biomedical science and engineering; fundamental research; and energy, environment, and urban technology. S.L.

**N83-24465#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
**JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY (SELECTED ARTICLES)**
Qiwen Huang, Mingbao Zhang, Honglin Deng, Shiming Zhao, Zhengming Yeng, Jiawei Zhang, and Zhengping Zhao 9 Dec. 1982 27 p refs Transl. into ENGLISH from Nanjing Daxue Xuebao (China), no. 1, 1982 p 102-112
(AD-A124002; FTD-ID(RS)T-0958-82) Avail: NTIS HC A03/MF A01 CSCL 05/1

The use of ellipsometry to measure the thickness of less than 50A ultrathin oxide films on silicon solar cells is described as well as the design of a copper chloride laser with an average power greater than 500 milliwatts and a lifetime exceeding 100 hours. A.R.H.

# SUBJECT INDEX



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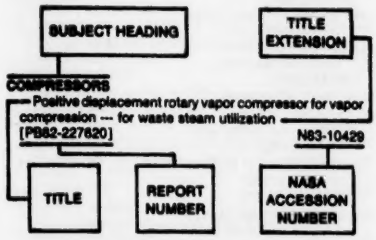


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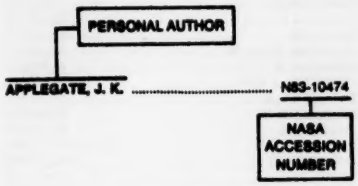


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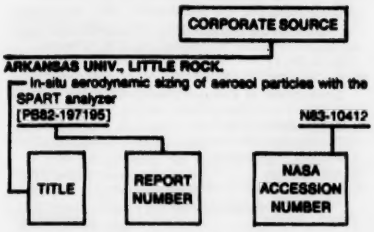


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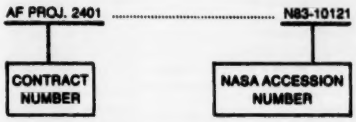


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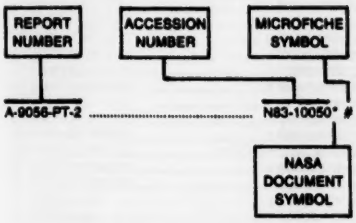


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